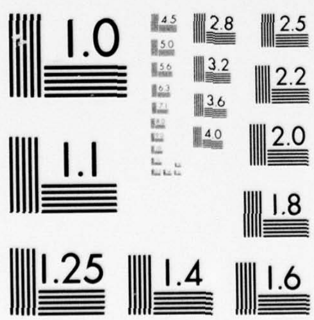
AD-A039 561 KAISER ENGINEERS OAKLAND CALIF F/G 15/5
PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM. VOLUME 9. --ETC(U)
MAY 77 DAAA21-75-C-0303
UNCLASSIFIED 75-86-R-9 NL

1 OF 4
AD
A039561

03956



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(12) NW

ANALYSIS OF THE CURRENT PEP CONCEPT FOR MUNITIONS METAL PARTS PRODUCTION IN THE PRIVATE SECTOR

VOLUME 9

PLANT EQUIPMENT PACKAGE MODERNIZATION PROGRAM

KAISER ENGINEERS

In Association with Stetter Associates, Inc.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) UNCLASSIFIED

14

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER 75-86-R-9	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) 6 Plant Equipment Package (PEP) Modernization Program. Volume 9. Analysis of the Current PEP Concept for Munitions Metal Parts Production in the Private Sector.		5. TYPE OF REPORT & PERIOD COVERED 9 Final rept. 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Kaiser Engineers/Stetter Associates, Inc.		8. CONTRACT OR GRANT NUMBER(s) 15 DAAA21-75-C-0303
9. PERFORMING ORGANIZATION NAME AND ADDRESS Henry J. Kaiser Company Kaiser Engineers Division 300 Lakeside Drive, Oakland, CA 94666		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS DD 1423
11. CONTROLLING OFFICE NAME AND ADDRESS Department of the Army DRCPM-PBM-G, Building 171 Picatinny Arsenal, Dover, New Jersey 07801		11 12. REPORT DATE May 1977 13. NUMBER OF PAGES 364 12 377p.
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approval for public release; distribution unlimited

194 625

DDC
RECEIVED
MAY 16 1977
C

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

A022 576

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Plant Equipment Package (PEP)	Skills
Industrial Plant Equipment (IPE)	Resources
Industrial Preparedness	Private Sector
Producers	PEP Concept

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

* Analysis and recommended improvements to the current PEP concept and the system of PEP management in terms of their impact on planned munitions metal parts production in private industry and ~~thereby facilitate~~ attainment of the PEP modernization objectives.

* This report presents

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

ANALYSIS OF THE CURRENT PEP CONCEPT
FOR MUNITIONS METAL PARTS PRODUCTION
IN THE PRIVATE SECTOR

Report No. 75-86-R-9

PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM

VOLUME 9

Prepared for Project Manager
Munitions Production Base Modernization and Expansion

Administered by Picatinny Arsenal
Contract No. DAAA21-75-C-0303

May 1977

KAISER ENGINEERS
In Association with Stetter Associates, Inc.

PEP MODERNIZATION PROJECT

TABLE OF CONTENTS - TASK B-9 REPORT

ANALYSIS OF THE CURRENT PEP CONCEPT
FOR MUNITIONS METAL PARTS PRODUCTION
IN THE PRIVATE SECTOR

LIST OF FIGURES

LIST OF TABLES

I. INTRODUCTION

A. BACKGROUND

The United States, unlike European countries, has never sponsored industrial establishments that specialize in the development, design, and production of heavy munitions (e.g., a Krupp or Vickers-Armstrong). Responsibility for supply of Army munitions has, from our country's beginning, been assigned to an office within the Army--currently, the assigned single-service manager. Supporting this office are the Army's ordnance arsenals, specializing in the art of munitions design, development, and manufacture.

From the earliest years of the nation until World War II, the Army depended largely upon the arsenals to produce the munitions needed. With the onset of World War II and the increasing complexity and magnitude of military hardware and munitions, the Government found that it could not depend upon the arsenals for the requisite production. The decision was made to rely upon private industry to produce the needed items, and only use Government facilities when private industry was unable to provide the necessary capability. Following World War II, the Government began executing planning agreements with private industry to ensure that the needed capability existed.

The current role of arsenals in production is to provide the technical assistance that enables both privately owned companies and Government facilities to manufacture specialized munitions components. Actual production is accomplished using Government-owned Government-operated plants (GOGO facilities), Government-owned contractor-operated plants (GOCO facilities), and contractor, e.g., privately-owned and operated plants.

Military munitions production is a highly specialized activity that has no civil counterpart. Furthermore, peacetime munitions production requirements of the armed services are not sufficient in themselves to provide a viable production base for all high-priority items required by current wartime scenarios. This fact, together with the need for tremendous quantities of various munitions in early stages of mobilization, requires establishment of a strong standby capability for munitions mobilization production.

It is planned that mobilization requirements will be satisfied by the aggregation of: (a) peacetime stocks on hand; (b) a core of active producers at minimum production rates, both private sector and GOCO/ GOGO, and; (c) a standby capability for conversion to munitions production by private establishments. This last category comprises existing private plants which would be converted at mobilization for production of small arms ammunition, fuzes, artillery shells, and other metal components.

Because of the unique nature of munitions manufacture and low peacetime production levels, adequate resources are not available in private industry during peacetime to ensure the needed mobilization capacity. Congress has, accordingly, recognized the need under these conditions for augmenting the assets of the private sector with Government-owned resources, specifically, with plant equipment packages (PEP's) of machine tools as stated in the following excerpt from Public Law 93-155, Section 2:

> "CONGRESSIONAL DECLARATION OF PURPOSE AND POLICY
>
> "Sec 2. In enacting this Act, it is the intent of Congress (1) to provide a comprehensive and continuous program for the future safety and for the defense of the United States by providing adequate measures whereby an essential nucleus of Government-owned industrial plants and an industrial reserve of machine tools and other industrial manufacturing equipment may be assured for immediate use to supply the needs of the Armed Forces in time of national emergency or in anticipation thereof; (2) that such Government-owned plants and such reserve shall not exceed in number or kind the minimum requirements for immediate use in time of national emergency, and that any such items which shall become excess to such requirements shall be disposed of as expeditiously as possible; (3) that to the maximum extent practicable, reliance will be placed upon private industry for support of defense production; and (4) that machine tools and other industrial manufacturing equipment may be held in plant equipment packages or in a general reserve to maintain a high state of readiness for production of critical items of defense materiel, to provide production capacity not available in private industry for defense materiel, or to assist private industry in time of national disaster."
>
> (Underscore added for emphasis).

Section 3 defines the term "plant equipment package (PEP)":

"The term 'plant equipment package' means a complement of active and idle machine tools and other industrial manufacturing equipment held by and under the control of the Department of Defense and approved by the Secretary for retention to produce particular defense materiel or defense supporting items at a specific level of output in the event of emergency."

Although PEP's are also used in connection with Government-owned facilities, this study was addressed only to PEP's associated with the private sector. As quoted above, congressional policy is to place reliance to the maximum extent practicable upon private industry for the support of defense production. This statement implies that PEP's are not intended to replace or supplant private industry resources, but rather to supplement them. Therefore, in the context of this study, the objective of the PEP concept is to augment privately owned capacity with Government-owned equipment.

From the end of the Korean conflict to the period of the Southeast Asia conflict, most Government-owned facilities were put into layaway, and planning agreements with private producers were again executed. PEP's were eminently successful in achieving their objectives in the Southeast Asia conflict. Their availability is judged by ARRCOM's staff to have reduced the response time in munitions production by 6-9 months; without PEP's, the response time would have been 12-18 months.

PEP's are considered essential in enabling private firms, both large and small, to provide immediate response to a national defense emergency. PEP's provide the needed resources to convert or expand production lines to the manufacture of military munitions and other defense materiel. In short, PEP's are a key element in the integrity of the mobilization production base, which in turn is the cornerstone of national defense.

Most of the equipment for PEP's was purchased during or before the Korean conflict. Some of the machinery and equipment has been operated beyond its original life expectancy; some has been stored where maintenance or layaway procedures have been ineffective. Thus, much of the equipment requires rehabilitation. There are pieces of equipment missing from some of the planned production lines, because of cannibalization or changes in the production process or planned item. As a result, the rated capacity and the ability to respond to mobilization requirements is questionable for many, if not most, planned munitions production lines.

To help alleviate these problems, the U.S. Army awarded Contract DAAA21-75-C-0303 to Kaiser Engineers, in association with Stetter Associates, Inc., to perform a comprehensive and detailed analysis of the munitions metal parts production base (PEP's) assigned to private industry. This contract will provide a modernization plan for the PEP's that form part of the mobilization base. The modernization plan will encompass a mix of existing, rehabilitated, and new equipment with production lines modernized to produce new and improved munitions, at closer tolerances, and with higher mechanical properties in the base metal. Modernized lines will be in compliance with existing pollution abatement and OSHA standards.

The detailed analysis of the PEP's comprised nine tasks, as listed below.

Task A:	Assess Government procedures for determining the condition of production equipment.
Task B-1:	Evaluate specified PEP's for mobilization responsiveness and production capacity, based on the Government's assessment of conditions.
Task B-2:	Develop model lines for specific planned items, to be used as frames of reference in analyzing each designated PEP producer.
Task B-3:	Analyze Government equipment rehabilitation policies and procedures.
Task B-4:	Analyze Government layaway policies and procedures.
Task B-5:	Analyze designated PEP's with respect to the appropriate model line and the assigned mobilization production requirement for each PEP and prepare a modernization plan for each PEP.
Tasks B-6/B-7:	Prepare an overall time-phased modernization plan for the PEP base included in this study.
Task B-8:	Develop an operational plan for use by the Government in executing the PEP modernization program.

Task B-9: Analyze and recommend improvements to the current PEP concept and PEP system in terms of their impact on planned munitions metal parts production in private industry and the consequent attainment of PEP modernization program objectives.

An additional task (F) studied the impact of automation/mechanization on startup time.

This report is the product of Task B-9.

B. PROGRAM OBJECTIVES AND STUDY PURPOSES

The objective of the PEP modernization program is to develop a plan for the phased modernization of PEP's that form the base for manufacturing munitions metal parts in private industry. Achieving this objective will ensure that the designated PEP base will be capable of meeting the Government's mobilization requirements and be consistent in investment with planned appropriation levels, as of now and in the future.

One required area of the Task B-9 study is the review and redefinition of the basic PEP concept and its implementation as an element of industrial preparedness planning to determine whether all elements necessary for production are available to achieve planned goals. A second required area of study is the system used by the Army for munitions base management. As production equipment needs to be modernized to meet current standards, so does the PEP management system need to be modernized to achieve a high state of readiness and meet the requirements of early response time implicit in current mobilization guidelines. In this connection, methods of acquiring, storing, retrieving, and managing the requisite data using current industrial preparedness planning methods, systems, and staffing also require review and evaluation.

The U.S. Army has recognized the need for both a comprehensive analysis of required PEP hardware and an objective assessment of the implementation and management system for packages of Government-owned equipment provided to private producers. This assessment considers the "real world," as developed by the PEP modernization program task teams from on-site data on existing producers, and it considers the existing system of managing PEP resources, providing the basis for analyses, findings, and recommendations. This Task

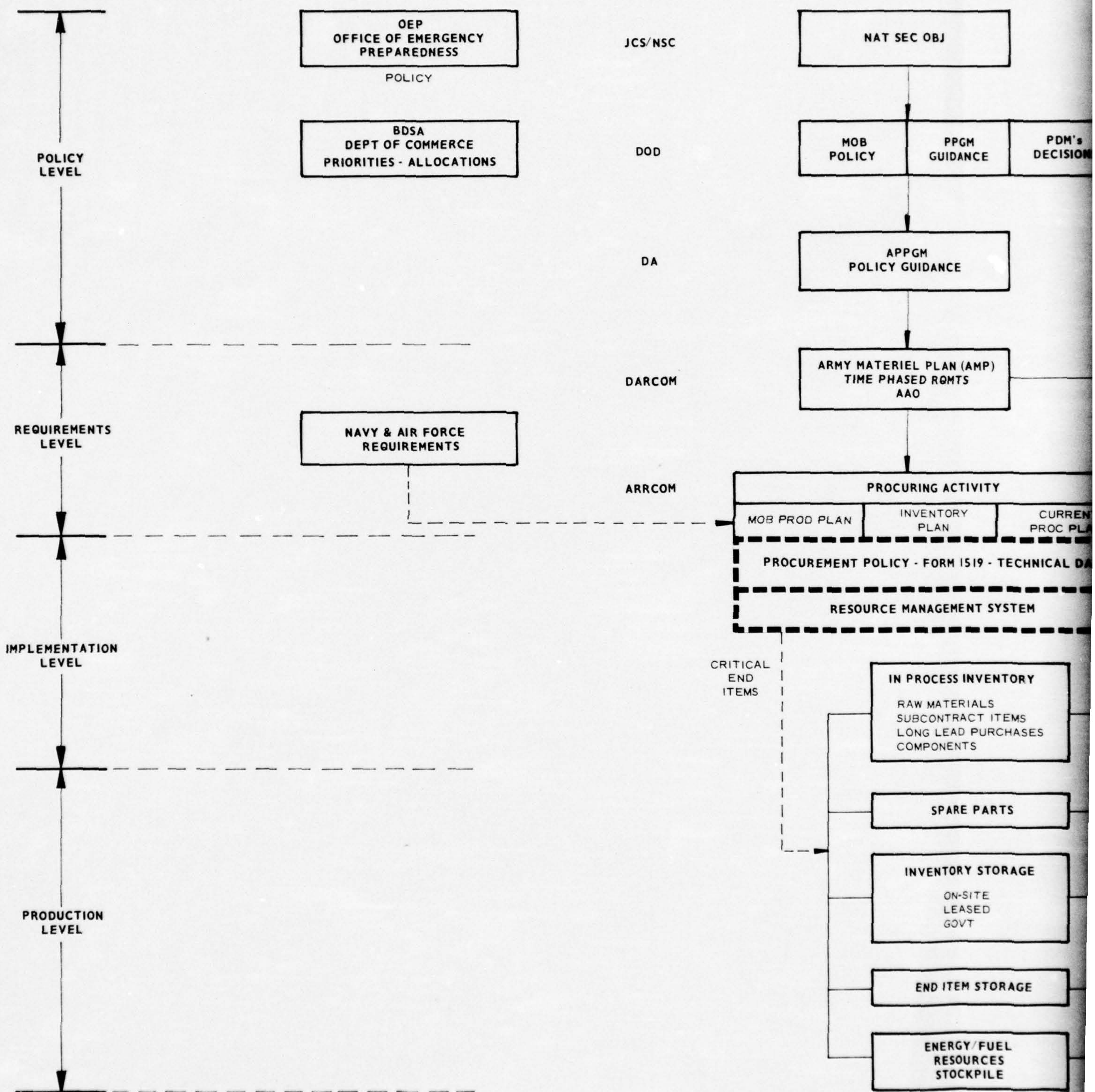
B-9, therefore, interfaces with the other eight tasks of the program, and its primary purpose is to facilitate achievement of the PEP modernization program objective.

C. STUDY SCOPE

The judgment of a team of specialists with extensive experience in managing and operating manufacturing plants and systems is reflected in this study. Key Government directives and policies, as well as findings from prior relevant studies, conferences, and programs, have been reviewed and considered. Current problems and capabilities have been discussed with those responsible for various aspects of industrial preparedness planning within the Department of Defense, Department of the Army, components thereof, and the civilian industry. The study team evaluated the management needs of large-scale production systems guided by their own experiences. Field observations were made of industrial preparedness planning in practical operation, obtained pursuant to the other project tasks described above. Therefore, this study is an evaluation by knowledgeable observers and not an empirical research study replete with statistics and quantifiable data in all areas.

Members of the task team had access to a considerable library of data, directives, and policy pertaining to military industrial preparedness planning in general and the PEP concept in particular. The study team has maintained an interface with personnel in numerous offices and organizations within DOD and DA who are knowledgeable of industrial preparedness planning. Complex problem areas addressed in other studies (with different purposes and objectives) have been researched for relevant information. Some data, such as background information, policies, and procedures, were obtained from informed Army and DOD staff and operating personnel during field trips. To maximize the coverage and effectiveness of the study team, their backgrounds and experience were augmented by the entire PEP modernization program team during the course of Task B-9. As in all studies of this type, some areas of inquiry were limited; these are described in the following paragraphs. Analyses and recommendations were confined to munitions metal parts production in the private sector.

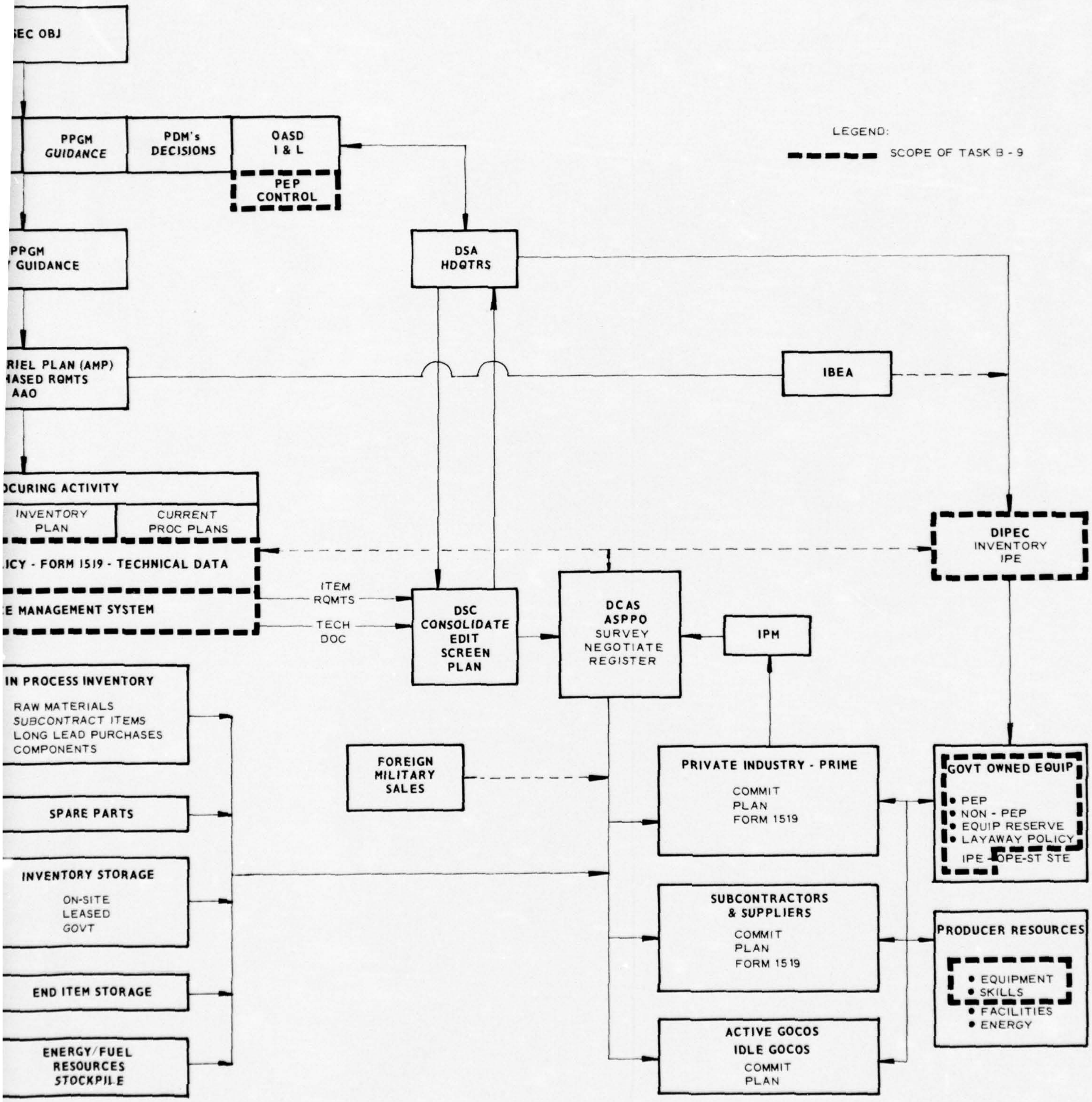
Study teams visiting designated producers' plants in connection with the Task B-5 analysis (to develop a modernization plan for various PEP's) provided empirical data pertinent to existing producers and production line capabilities.



POLICY LEVEL
REQUIREMENTS LEVEL
IMPLEMENTATION LEVEL
PRODUCTION LEVEL
OEP
OFFICE OF EMERGENCY PREPAREDNESS
POLICY
BDSA
DEPT OF COMMERCE
PRIORITIES - ALLOCATIONS
NAVY & AIR FORCE REQUIREMENTS
JCS/NSC
DOD
DA
DARCOM
ARRCOM
NAT SEC OBJ
MOB POLICY
PPGM GUIDANCE
PDM's DECISION
APPGM POLICY GUIDANCE
ARMY MATERIEL PLAN (AMP)
TIME PHASED RQMTS
AAO
PROCURING ACTIVITY
MOB PROD PLAN
INVENTORY PLAN
CURREN
PROC PL
PROCUREMENT POLICY - FORM 1519 - TECHNICAL DA
RESOURCE MANAGEMENT SYSTEM
CRITICAL END ITEMS
IN PROCESS INVENTORY
RAW MATERIALS
SUBCONTRACT ITEMS
LONG LEAD PURCHASES
COMPONENTS
SPARE PARTS
INVENTORY STORAGE
ON-SITE
LEASED
GOVT
END ITEM STORAGE
ENERGY/FUEL RESOURCES STOCKPILE

FIGURE I - 1

PRINCIPAL ELEMENTS OF INDUSTRIAL PREPAREDNESS PLANNING MUNITIONS BASE



2

Principal activities comprising total industrial preparedness planning for the munitions base system are shown in Figure I-1. Those areas of inquiry addressed by this study are identified by the dashed outline. Four planning levels are shown at the left of Figure I-1 as follows:

- Policy Level

  High-level industrial preparedness planning policy originates in the National Security Council and with the Joint Chiefs of Staff. This policy is interpreted and promulgated by DOD to the Department of the Army, which in turn provides policy guidance to subordinate commands. This study does not address the policy area, except those policies pertaining to PEP's under the cognizance of the Assistant Secretary of Defense (Installation and Logistics), as shown in Figure I-1.

- Requirements Level

  The requirements level extends from DARCOM through ARRCOM, which is the procuring agency. The Army's time-phased ammunition requirements included in the Army Materiel Plan developed by DARCOM are coordinated by ARRCOM, and includes Air Force and Navy requirements from which ARRCOM generates specific planned item requirements embodied in the Production Base Analysis (PBA) and the Production Base Plan (PBP). This study does not address formulation of requirements.

- Implementation Level

  The PBA, essentially a long-range mobilization plan, includes mobilization requirements, producer capacities, and projections for introducing modernized, converted, and expanded facilities. The PBP, essentially a five-year current procurement plan, contains data on warm base producers, cold base producers, current year production stockpile, condition of stockpile, and mobilization requirements.

  The procuring activity, ARRCOM, implements these plans in terms of: (a) current procurement action and policy; (b) mobilization planning by initiation of DD Form 1519's, and; (c) technical data packages (TDP's) and other technical specifications. In so doing, ARRCOM exercises resource management system functions to plan, manage, and administer the needed

production base resources. (This study addresses these three areas, as indicated in Figure I-1.)

ARRCOM does not normally deal directly with producers in mobilization production planning; another agency is used for this interface, as shown in Figure I-1. An Armed Services Procurement Planning Officer (ASPPO), who reports to the Defense Supply Agency (DSA), makes direct contact with industry management to negotiate tentative mobilization schedules. (This area is not included in the scope of this study.) ARRCOM uses another DSA agency, the Defense Industrial Production Equipment Center (DIPEC), to provide inventory reporting for industrial plant equipment assigned to PEP's. Modernization and expansion planning for upgrading the base capability uses the PBA, the PBP, plant workloading studies, and long- and short-range procurement plans. The current PEP modernization program is a major input for determining the best way to modernize the base to satisfy mobilization production requirements.

o <u>Production Level</u>

At the production level in private industry, the scope is focused on Government- and producer-owned resources; Government-owned plants are excluded from this study. Figure I-1 shows (at bottom center) in-process inventory and other planning considerations required for early production of critical end items. Foreign military sales are also shown as a factor impacting mobilization production. Neither of these subjects is included in the study scope.

Considering these four levels of planning, this study addresses the implementation level managed by the Army. ARRCOM's procuring activity functions with particular emphasis on industrial preparedness planning, procurement, the resource management system, and the production level in private industry; that is, producers' resources augmented by Government-owned equipment (including PEP's). These two areas are considered to offer the greatest potential for benefit in this study, because of the following:

o They constitute a self-contained subsystem of resources, data, and resource management in which improvements can be

achieved independent of any interaction with other areas of industrial preparedness planning.

- They are areas of inquiry with pressing deficiencies and problems.

- They can be studied using data and analyses produced by the other tasks in the total PEP modernization program.

- Their scope is consistent with the planned level of effort.

D. EXISTING SYSTEM POTENTIAL

The existing munitions base has been a successfully implemented program proven in the several national defense emergencies of the recent past, including World War II, the Korean conflict, and the Southeast Asia conflict. The concept of the mobilization base embodies advance planning by both the Army and private industry that will result in an early response to a national defense emergency. Implementing this concept is the function of industrial preparedness planning (IPP).

A viable base of planned producers is available, many of whom rely on the Government-owned PEP's. Implementation of the PEP concept has enabled the Army to retain and allocate approximately $600 million (initial acquisition cost) of industrial plant equipment for improving industrial preparedness to produce needed materiel. This equipment retention authority (i.e., PEP's) constitutes a vital element in the nation's total munitions production capability.

For ease in implementing an early response, technical data packages and related military specifications are available, with the essential technical expertise provided by Army ordnance specialists, both military and civilian. To define the responsibilities and authority at each IPP level, comprehensive policy and procedural directives and manuals have been provided. A single-service manager has also been selected for ease in managing the conventional munitions base. The role of single-service manager for conventional munitions has been assigned to the U.S. Army by DOD. The single-service manager is responsible for the procurement, production, supply, and maintenance/renovation of conventional ammunition for the Army, Navy, Marine Corps, and Air Force.

Although the existing system has been successful and viable, the need for improvement and modernization has been recognized by DOD decision makers at all levels. Several deficiencies and problem areas within the existing munitions production base have been identified. Some of these are equipment related (i.e., over age, obsolete, or cannibalized industrial plant equipment). However, others are associated with the generally low priority of funding and staffing accorded IPP, together with increased demands for: (a) early startup; (b) new developments in technology, and; (c) rapid response to changes in scenarios and resultant planned item requirements. The net result is that the existing IPP for the munitions base, in many cases, cannot ensure the achievement of responsive and committed production capacity to meet stated requirements; thus, the system of PEP management needs to be improved and modernized.

A recent (December 1974) study by Arthur D. Little, Inc. for the Arms Control and Disarmament Agency reviewed the subject of IPP in an arms control environment. Its findings, encompassing IPP of all services, generally corroborates the need for improvement and modernization. Four of its findings listed below are of interest in connection with this PEP analysis.

(1) Industrial mobilization capability is, in itself, a significant deterrent to war.

(2) Improvement is required in the U.S. industrial mobilization capability.

(3) The U.S. industrial preparedness system as it exists today lacks coordination.

(4) Some of the options for improving IPP appear to be the following:

- o Expand stockpiling to include key long lead time components and machine tools.
- o Maintain a war production base in selected product lines to shorten production lead time.
- o Continue critical review of procurement practices.
- o Improve the effectiveness of present levels and types of financial incentives to producers.

The main thrust of this study, then, is to examine existing PEP's (assigned to the munitions base private sector), and the production system of which they are an element, with the goal of recommending improvements in the system to ensure the capability of meeting mobilization requirements. Eight features of this study render it unique among the several that have addressed various aspects of Government-owned industrial plant equipment and industrial preparedness planning. These eight features are as follows:

(1) Main consideration is directed to PEP's.

(2) Government directives relating to PEP's are reviewed.

(3) Both conceptual and real-world aspects of PEP's are examined in terms of their efficacy as elements of the system needed for munitions metal parts production.

(4) Updated production line data are incorporated. These data were obtained by teams of specialists during on-site analyses of planned producers and producers' lines.

(5) The existing resource management system is critiqued, and proposed system features are developed.

(6) Problems are considered on the same basis as mobilization planning; that is, in terms of production line capability for each planned item.

(7) Current policies and procedures are discussed with respect to mobilization base response capability.

(8) Potential applicability to other Government PEP's and, at least partially, to the total mobilization base is determined.

E. ORGANIZATION OF THE REPORT

The report is divided into the following sections:

- Section I is an introduction to the report and includes the purpose and scope of the Task B-9 work effort.

- Section II presents an overview of the study and an executive summary.

- Section III contains the report's conclusions and recommendations, including recommendations for implementation.

- Section IV addresses the problem of defining production resources and develops the need to refine PEP equipment nomenclature to correlate each piece of PEP equipment with a specific planned item or items.

- Section V describes existing planned producers in terms of significant statistical data and current industrial preparedness planning and procurement policy. An assessment of the overall capabilities of planned producers to respond to mobilization requirements is included.

- Section VI contains a discussion of industrial plant equipment (IPE) in the current PEP inventory with emphasis on mobilization responsiveness, together with a proposed approach to determine the optimum practicable distribution of equipment resources against requirements.

- Significant problems relating to skills, technical documentation, and pertinent directives are described in Sections VII, VIII, and IX, respectively.

- Section X describes the resource management system features needed for effective mobilization planning and presents a recommended system approach.

- Section XI contains a glossary, bibliography, report summaries, and other backup data supporting the task analyses.

II. SUMMARY

A. PROGRAM BACKGROUND AND OBJECTIVE

1. Background

Because of the unique nature of munitions manufacture and low peacetime production levels, adequate resources are not available in private industry during peacetime to ensure the needed mobilization capacity. Congress has, accordingly, recognized the need under these conditions for augmenting the assets of the private sector with Government-owned resources; specifically, with plant equipment packages (PEP's) of machine tools.

PEP's are considered essential in enabling private firms, both large and small, to provide immediate response in a national defense emergency. PEP's provide the needed resources to convert or expand production lines to the manufacture of military munitions and other defense materiel. In short, PEP's are a key element in the integrity of the mobilization production base, which in turn is the cornerstone of national defense.

Most of the equipment for PEP's was purchased during or before the Korean conflict. Some of the machinery and equipment has been operated beyond the original life expectancy; some has been stored where maintenance or layaway procedures have been ineffective. Thus, much of the equipment requires rehabilitation. There are pieces of equipment missing from some of the planned item production lines, because of cannibalization and changes in the production process or planned item. As a result, the rated capacity and the ability to respond to mobilization requirements are questionable for many, if not most, planned munitions production lines.

To help alleviate these problems, the U.S. Army awarded Contract DAAA21-75-C-0303 to Kaiser Engineers, in association with Stetter Associates, Inc., to perform a comprehensive and detailed analysis of the munitions metal parts production base assigned to private industry. This contract will provide a modernization plan for the PEP's that form part of the mobilization base. This modernization plan will comprise a mix of existing, rehabilitated, and new equipment with production lines modernized to produce new and improved munitions, at closer

tolerances, and with higher mechanical properties in the base metal. Modernized lines will be in compliance with existing pollution abatement and OSHA standards.

2. Program Objective

The objective of the Program is to ensure that the designated PEP base will be capable of meeting the Government's mobilization requirements and be consistent with planned appropriation levels over the long range.

The objective of Task B-9 of the Program is to analyze and recommend improvements to the current PEP concept and the system of PEP management in terms of their impact on planned munitions metal parts production in private industry and thereby facilitate attainment of the PEP modernization program objectives.

This report presents the results of Task B-9.

B. STUDY SCOPE

1. Areas of Inquiry

Analyses and recommendations were confined to munitions metal parts production in the private sector. Due to the integrated nature of industrial preparedness planning (IPP), implementation of these recommendations is deemed to require coordination within DARCOM.

Principal activities comprising industrial preparedness planning for the munitions base system are shown in Figure II-1, with the major areas of inquiry addressed in this study shown in shaded boxes:

- ARRCOM's munitions production base management function which supports IPP in the private sector

- Government- and producer-owned resources at the production level in private industry

- Policy and practices pertaining to PEP's as promulgated and administered by the cognizant DOD and DA agencies.

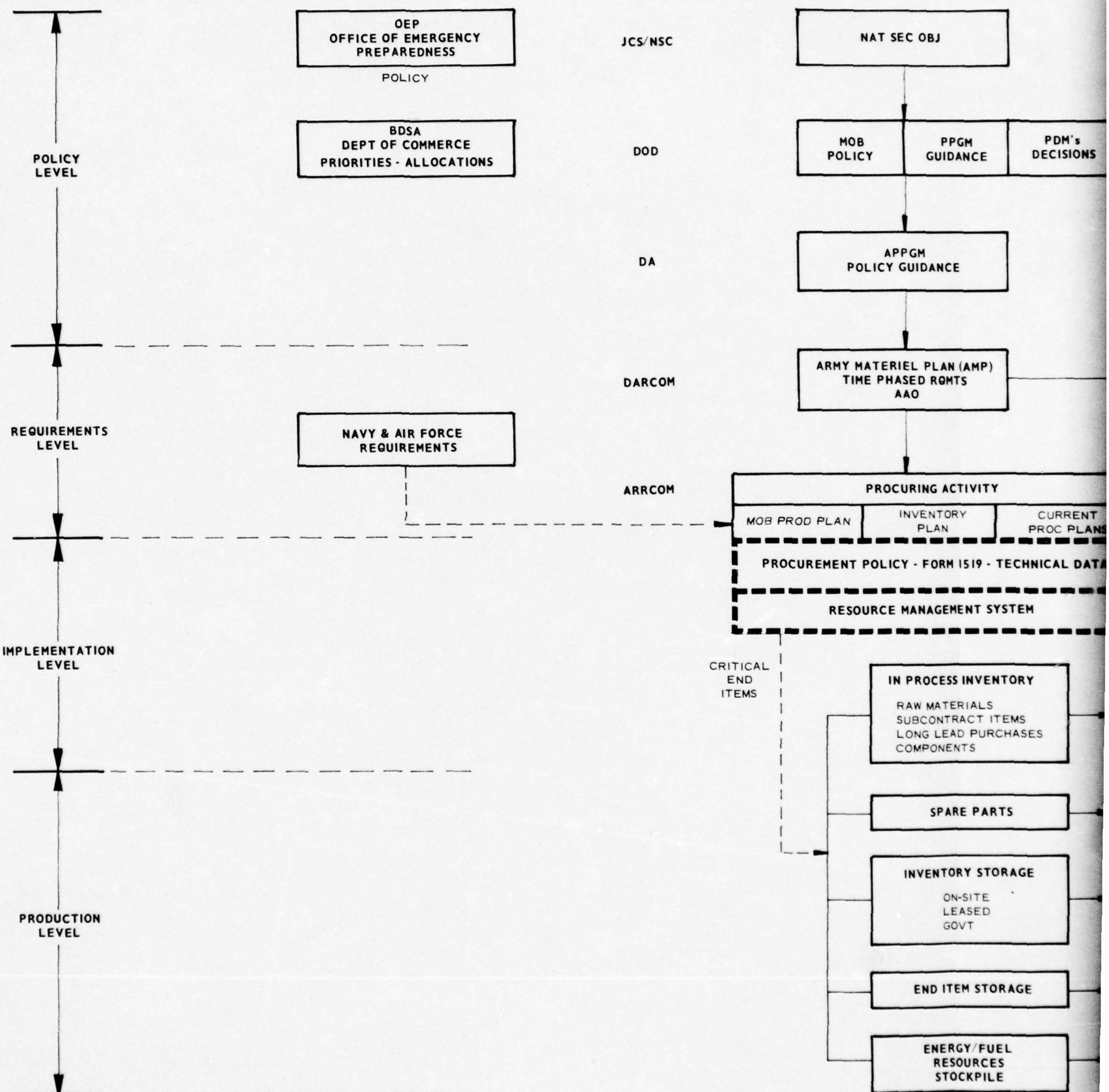

POLICY LEVEL
REQUIREMENTS LEVEL
IMPLEMENTATION LEVEL
PRODUCTION LEVEL
OEP
OFFICE OF EMERGENCY PREPAREDNESS
POLICY
BDSA
DEPT OF COMMERCE
PRIORITIES - ALLOCATIONS
NAVY & AIR FORCE REQUIREMENTS
JCS/NSC
DOD
DA
DARCOM
ARRCOM
NAT SEC OBJ
MOB POLICY
PPGM GUIDANCE
PDM's DECISIONS
APPGM
POLICY GUIDANCE
ARMY MATERIEL PLAN (AMP)
TIME PHASED RQMTS
AAO
PROCURING ACTIVITY
MOB PROD PLAN
INVENTORY PLAN
CURRENT PROC PLANS
PROCUREMENT POLICY - FORM 1519 - TECHNICAL DATA
RESOURCE MANAGEMENT SYSTEM
CRITICAL END ITEMS
IN PROCESS INVENTORY
RAW MATERIALS
SUBCONTRACT ITEMS
LONG LEAD PURCHASES
COMPONENTS
SPARE PARTS
INVENTORY STORAGE
ON-SITE
LEASED
GOVT
END ITEM STORAGE
ENERGY/FUEL
RESOURCES
STOCKPILE

FIGURE II - 1

PRINCIPAL ELEMENTS OF INDUSTRIAL PREPAREDNESS PLANNING MUNITIONS BASE

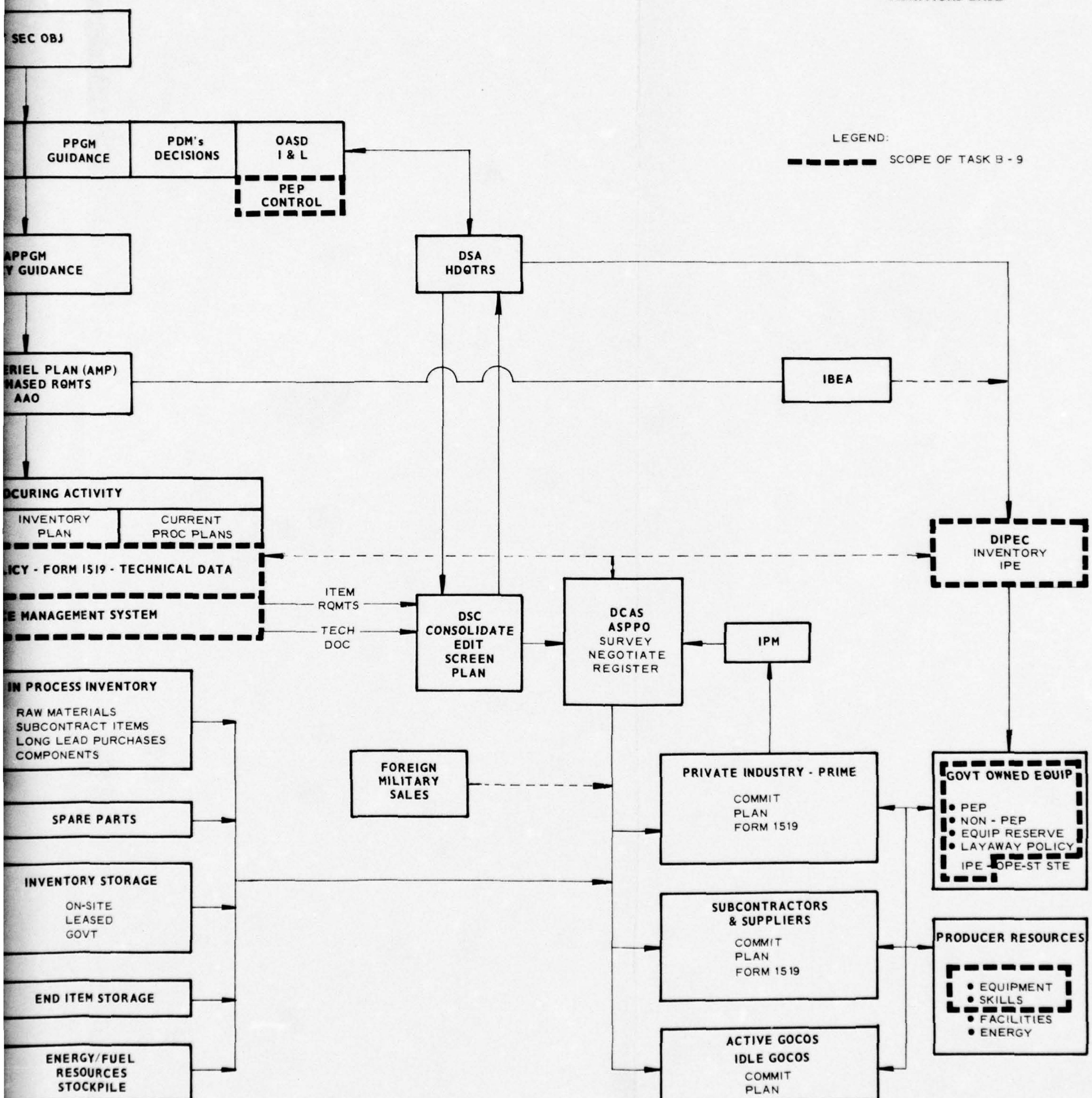
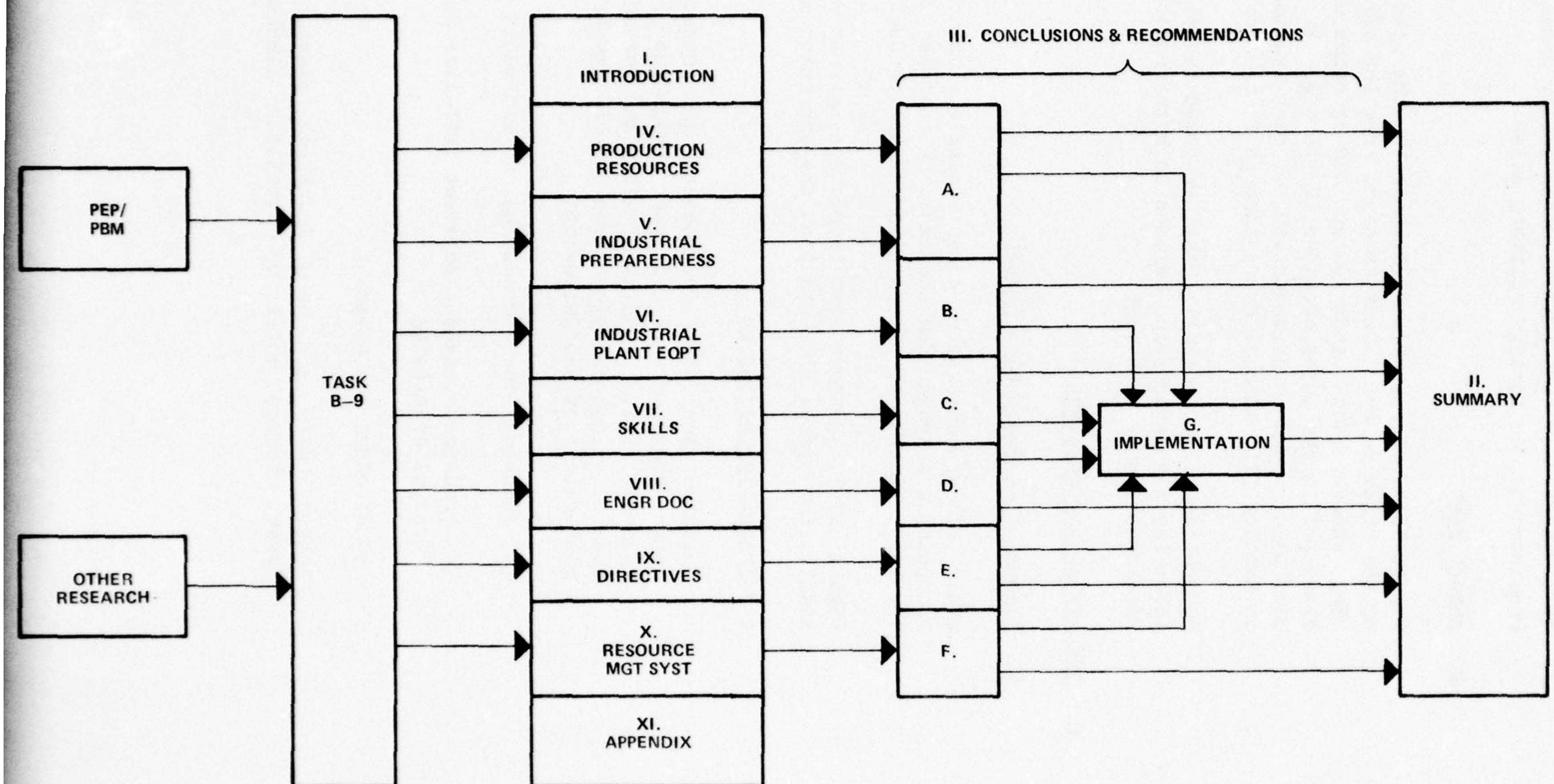


FIGURE II - 2

REPORT PLAN



This study does not address other policy areas, formulation of requirements, or foreign military sales.

2. Report Plan

Figure II-2, "Report Plan", illustrates the plan for preparation of the study report. Data received from the offices of DARCOM-PBM, ARRCOM, and other DA and DOD agencies were analyzed and discussed in the major sections IV through X. The principal conclusions and recommendations of each section were developed in Section III, subsections A through F, as shown.

Subsection III.G details the proposed tasks for implementing those recommendations and defines both the rationale and interrelationships of each task.

C. INDUSTRIAL PREPAREDNESS

1. Planned Item Production System

Since PEP's constitute only a single element in a system for producing a planned item they must be reviewed in the context of the total system; i.e., the planned item production system.

Figure II-3, "Planned Item Production System" depicts the three significant system elements that are addressed in this study:

- Production Resources

  Included are both Government- and producer-owned complements, together with the other categories of required resources; i.e., funding, skills and engineering data. Industrial plant equipment from one PEP may be sited in any combination of the following:

  (1) Producer line - producing, or stored in place

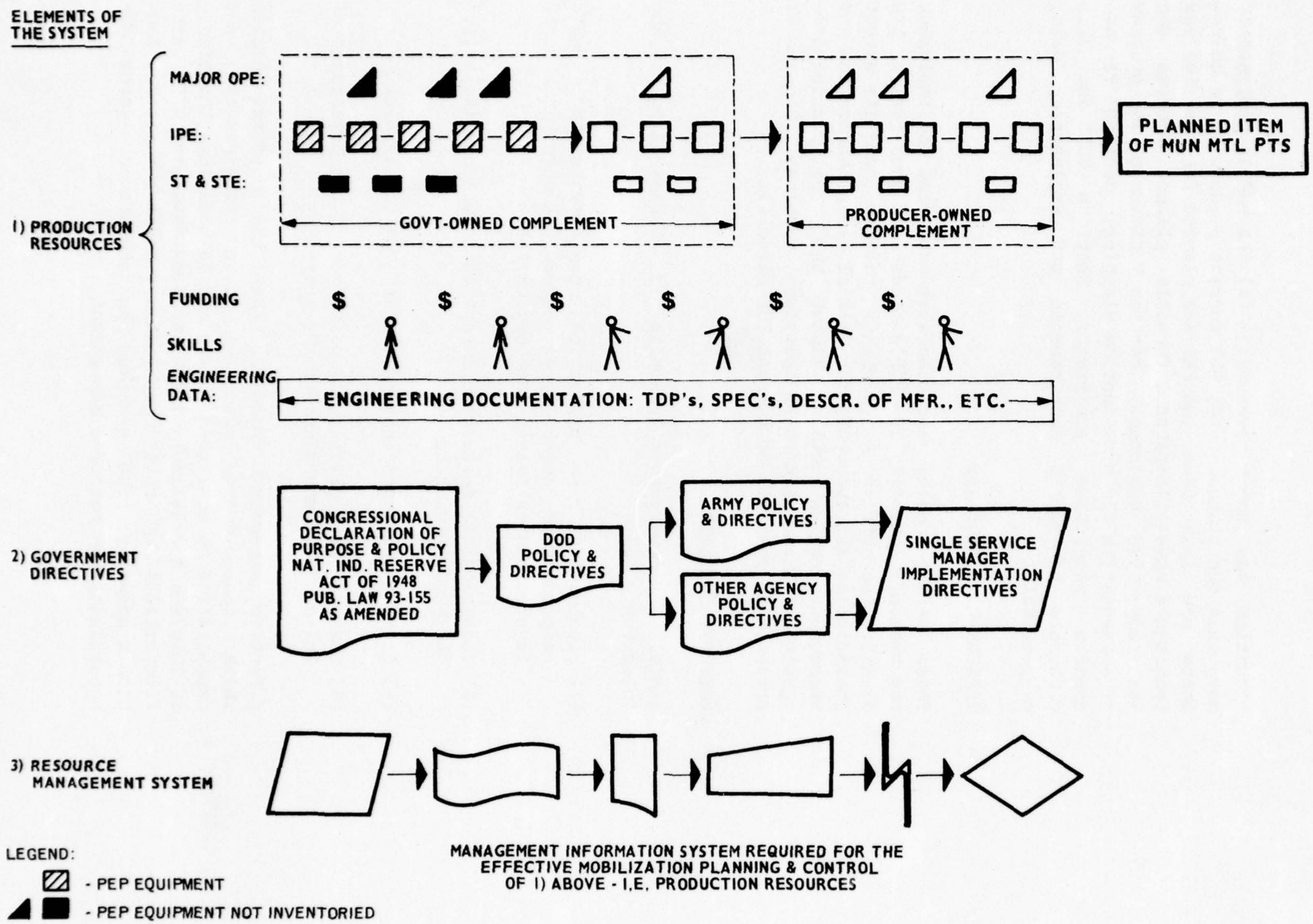
  (2) Producer storage - adjacent (off-line but on or near the site) or offsite

  (3) Government storage

  Active PEP's may have industrial plant equipment in different storage modes or locations simultaneously. This

FIGURE II - 3

PLANNED ITEM PRODUCTION SYSTEM FOR MUNITIONS METAL PARTS PLANNED PRODUCTION IN THE PRIVATE SECTOR



situation can occur because: (a) the PEP is assigned to more than one planned item; (b) current production requirements are less than the PEP was planned for, or; (c) new techniques have eliminated a formerly planned process and its respective equipment. Section V discusses the problem of compensation for mobilization planning; Section VI addresses production equipment; Sections VII and VIII elaborate on skills requirements and engineering data, respectively.

- Government Directives

  These define policy and otherwise authorize and implement the system. Authority for PEP's is derived from Public Law 93-155; the Office of ASD(I&L) retains under its direct jurisdiction all authority for initial PEP authorization and subsequent review action without the usual routine delegation of these matters to individual services. Section IX presents an analysis of current PEP directives.

- Resource Management

  Munitions preparedness planning is characterized by the following:

  (1) Fluctuations in production requirements and needed response time, depending on the current scenario, force levels, and estimated consumption rates

  (2) Technological developments that introduce new items into the production base

  (3) Planned producers leaving and/or joining the base

  (4) Changes in policies and practices of the Department of Defense and Department of the Army

  Effective management requires that the constant changes which characterize munitions base requirements and capabilities be continuously subject to updating; therefore, it involves a relatively large, complex data bank with wide fluctuations of both input data and model parameters. Section X addresses the proposed computer-based system for modernizing PEP resource management.

2. Planning Considerations

Implementing the PEP concept has enabled the Army to retain and allocate approximately $600 million (initial acquisition cost) of industrial plant equipment for improving industrial preparedness; this equipment retention authority constitutes a vital element in the nation's total munitions production capability.

The PEP concept was eminently successful during the Southeast Asia conflict in ensuring the availability of an industrial production capability to meet requirements for national defense; lead times for munitions production were reduced from the 12-18 months experienced in Korea to 6-9 months for the Vietnam buildup.

Current mobilization requirements emphasize a high state of readiness and early (within 180 days) response for a wide range of critical items. As a result, the current emphasis on industrial preparedness has, to some degree, shifted to stockpiling planned items as a supplement or alternative to developing the capability to produce them in a timely manner from the mobilization base.

Department of the Army policy is stated in AR 700-90; "DA depends on private industry as the foundation for production of military material." However, peacetime cooperation by the private sector is on a voluntary basis; as stated in DOD 4005.3-M, "...the participation of industrial management in the (Mobilization) Program, while vital to its success, is entirely voluntary. Mobilization production plans will not be effected for privately owned facilities without the consent and cooperation of management."

3. Planned Producers

Recent trends indicate a withdrawal of capable firms from the munitions base--about 15 within the past two years. The list of producers that have withdrawn from the mobilization base includes some prominent and otherwise capable firms, as well as some firms that are now defunct.

It is possible that the attrition of the base in terms of numbers of producers could in fact be a favorable development if

the capabilities of the remaining producers were being concurrently upgraded.

The level to which Government-owned assets are required to supplement those of the producer is, to a significant degree, dependent on the capability of firms brought into the mobilization base. Current practice is to augment the producer's equipment with PEP's and to award facilities contracts as incentives to encourage participation in the base. This practice permits highly leveraged firms with low overhead and minimal privately-owned, inhouse equipment commitments to obtain up to 100% of needed planned item production equipment from Government PEP's. Thus, the policy of providing ready availability of PEP's encourages producers, who otherwise may never have an interest in munitions programs, to participate.

Prime causes for lack of participation in the base include the cyclical nature of munitions procurement, which is characterized by short-term contracts, the many complex Government procedures, the required documentation demonstrating adherence to procedures, and the excessive interface requirements with Government personnel.

Forty-two assigned PEP producers were evaluated in terms of 11 significant criteria (not including management and financial capability), to assess the mobilization readiness posture of the producers. Data for this qualitative assessment were developed from the Task B-5 plant visit reports. Results of the analysis indicated the following:

(1) None of the 42 firms met all 11 criteria.

(2) Existence of a good quality assurance program is the only criterion met by as many as 32 firms.

(3) About one third of the firms lacked adequate facility space for mobilization production, or lacked plant layout drawings or control data for their industrial plant equipment.

(4) More than half of the firms have OSHA and pollution problems; lacked tooling production capability, technical data packages, laboratory facilities, and adequate mobilization planning; and were substantially dependent on military work. Based on this review of representative active producers, the

capability of existing PEP producers to meet planned mobilization assignments must be validated.

Private industry is the generator of advanced production technology. The need to transfer this technology to the munitions base has been recognized by the Government, and steps are being taken to implement such transfer. Therefore, to take full advantage of the ingenuity in our national industrial base requires having qualified firms to provide a strong input of new technology and improved manufacturing systems.

4. Planning Data

The Government's capability in assessing the productive capability of each planned producer is hampered by five deficiencies in PEP inventory and other data:

(1) DIPEC PEP records show only industrial plant equipment.

(2) Specific equipment is not identified with planned item(s).

(3) Non-PEP Government-furnished equipment is not included in inventory or planned item assignment. This category averages about 40 percent of the total Government-owned equipment in producers' plants.

(4) Producer-owned equipment integral to the production capability being retained in a PEP is not inventoried, nor is this equipment identified by planned item assignment.

(5) Adequate condition assessment data for most significant items of equipment are not available. These data for PEP equipment are being obtained for those PEP's considered in the PEP Modernization Program.

DD Form 1519 is the source document used by Government planners to define mobilization base capability and capacity. The validity of the entire industrial preparedness planning effort depends on the accuracy of the data in the compilation of DD 1519's.

DD Form 1519's, as currently used, include the following deficiencies:

(1) Inaccurate data: some producers and subcontractors have overplanned with respect to capacity.

(2) Key data elements have not been validated by adequate production planning or manufacturing engineering.

(3) The latest revision of the TDP is not always available.

(4) The lack of a binding contract results in instances of "lip service" to the agreement on the part of both Government and planned producer, because it is viewed solely as an agreement to negotiate a production contract at some future date without any commitment to do so. Therefore, bona fide mobilization commitments do not exist on the part of either the Government or the producer, unless they are included in facilities or production contracts.

5. <u>Related Studies</u>

Recent studies by Arthur D. Little, Inc., the RAMP study, and the SCRAM study have focused attention on the importance of, and the need for, improvements in industrial preparedness planning.

KE/SAI concur, in general, with the following:

(1) Portions of the RAMP and SCRAM reports that identify deficiencies in current industrial preparedness planning

(2) Comments in the RAMP report about the need for improving the preparedness program and munitions production base management by additional high-level support

However, KE/SAI also conclude that the thrust of corrective action should be directed to well-defined tasks designed to improve the methodology, capability, and system of industrial preparedness planning as enumerated in this report.

The KE/SAI position on peacetime acceleration planning differs from both the RAMP and SCRAM studies, as KE/SAI consider that this should be an included aspect of industrial preparedness planning. If additional planning entities are needed, they should be organized within the industrial preparedness function and tasked to upgrade the total industrial preparedness planning effort, including peacetime acceleration.

SCRAM assumptions were that PEP utilization under peacetime acceleration will be based on actual condition and location. These data currently require validation; consequently, the ARRCOM inhouse plant analysis and audit capabilities, as noted in the following paragraphs, are required for proper acceleration planning. This should be integral to the total industrial preparedness planning function as noted above.

6. Findings and Conclusions

Although a viable base of planned producers exists, deficiencies and problems associated with the PEP's have emerged in the following areas:

- The base capability has been diminished because of producer withdrawals or diminished capability of producers (e.g., loss of skills).
- Confidence in the validity of basic industrial preparedness planning data has decreased, as noted in the foregoing paragraphs.
- Equipment is over age, obsolescent, or has been cannibalized.
- Priority is low for funding and staffing for industrial preparedness planning and munitions base management.
- Current resource management relies heavily on a relatively slow manual data processing system and a dwindling pool of expertise.

It is concluded that the Government does not have accurate data concerning the total production resource requirements and capability to manufacture a given planned item in a given producer's plant, and that existing munitions base management systems need to be modernized. As a result, existing industrial preparedness planning for the munitions base, in many cases, cannot ensure that a responsive and committed production capacity can be achieved to meet stated requirements.

The munitions base management task requires a modernized package of management tools, policy, and practice.

7. Recommendations

Modernization of the munitions production base and its management system in terms of correlated tasks should be planned for and implemented; the ultimate objective is to achieve the requisite confidence level in munitions industrial preparedness planning.

Specific tasks are proposed which come under the cognizance of the two Army authorities associated with this study, as follows:

(1) DRCPM-PBM - PEP Division

(a) Develop a PEP Modernization and Management Manual to correlate and consolidate all policies and procedures applicable to modernization and operations of PEP's, including those assigned to GOCO's, GOGO's, and private producers. A manual of instructions for layaway and startup by generic equipment types should also be developed. See Subsection III.E for details of recommendations concerning PEP system directives.

(b) Perform modernization analyses for inactive PEP's and 44 X-facilities not currently included in the PEP Modernization Program.

(c) Perform manufacturing engineering analyses to develop production line sequence of operations with proper machinery and equipment selection to define each line for all planned items.

(2) ARRCOM - Industrial Management Division

ARRCOM should achieve a dynamic production planning and management capability for munitions production that has validity under differing scenarios, ranging from peacetime production to peacetime acceleration in a limited conflict to full mobilization. This capability should include provisions for the following:

(1) An ongoing plant analysis and audit function to provide periodic interface with each planned producer, including validation of relevant data and assumptions required in munitions planning.

(2) Implementation of facilities contracts, where feasible, to commit the private sector for production under either peacetime acceleration or mobilization conditions.

(3) Acquisition of a needed data bank, on a priority basis.

(4) Development of a resource management system that can meet the demands implicit in effective munitions base management, the high level of readiness required, and the frequent changes in planned item requirements and capabilities. See Subsection III.F for details of recommendations concerning the Resource Management System and III.B. for details of recommendations concerning Resources/Requirements Analyses.

ARRCOM should assess and upgrade planned producer capability, including provisions for the following:

o On a selective basis, upgrade, modernize and reassign resources to ensure the ability of IPP to provide for authorized mobilization requirements.

o Provide a reasonable incentive to planned producers to:

- Plan for peacetime acceleration and mobilization production

- Acquire requisite equipment and capability

- Produce at 1-8-5 MSR, or as specified

- Retain production capability for mobilization or peacetime acceleration

- Cooperate with a periodic audit by qualified Government assigned personnel to assure that capability is being retained.

o If deemed to be cost effective, provide PEP inventories with a designator to identify those pieces of PEP's required for each planned item.

- o Revise practice and procedures for developing data included on DD Form 1519 to ensure greater accuracy; perform periodic audits of the DD 1519's for validation.

- o Implement facilities contracts with selected producers and, if feasible, include provisions for committed mobilization or peacetime acceleration production.

Subsection I summarizes the proposed implementation of these recommendations as elaborated in Section III, Subsection G.

D. INDUSTRIAL PLANT EQUIPMENT (IPE)

1. Army Inventory

Industrial plant equipment (IPE) constitutes the nucleus of the PEP's and is defined by DOD to be used for the purpose of altering the physical, electrical, or chemical properties of materials; it includes only that plant equipment with an acquisition cost of $1,000 or more.

Not included in the DOD definition of IPE are: (a) IPE having less than $1,000 original cost; (b) special tooling (ST); (c) special test equipment (STE), and; (d) items of other plant equipment (OPE) such as material handling equipment.

Machine tool IPE occupied a key role in World War II munitions planning, since the available supply constituted the principal bottleneck in the rearmament program. The importance of machine tools in munitions production is highlighted by the fact that the US Army Ordnance Service was more concerned with machine tools than was any other service.

Table II-1 presents current Army-owned IPE in terms of total Army, DARCOM, and major subordinate command total inventories. This is the latest available inventory from the Defense Supply Agency of all PEP's in the Department of Defense.

Comparison with Table II-2 shows that close to one half of the original acquisition cost of all Army-owned IPE is included in Army assigned PEP's ($600/$1,200 million). Only about 28 percent of the Army-owned IPE items are assigned specifically to PEP's (32,000/114,000).

TABLE II-1
U.S. ARMY-OWNED IPE

Command	Active Quantity	Active Cost*	Inactive Quantity	Inactive Cost*	Total Quantity	Total Cost*
Army Total	86,658	$805.3	27,230	$479.8	113,888	$1,285.1
DARCOM Total	75,047	756.1	27,105	477.3	102,152	1,233.4
ARRCOM	32,699	439.9	23,207	399.0	55,906	838.9
AVSCOM	1,082	24.3	290	8.1	1,372	32.4
ECOM	4,350	22.1	146	0.7	4,496	22.8
MICOM	7,098	56.7	2	0.1	7,100	56.8
TARCOM	3,463	56.6	3,342	67.9	6,805	124.5
TECOM	8,198	41.1	0	0	8,198	41.1
TROSCOM	284	2.3	1	0.001	285	2.3
DEPOTS	10,310	71.6	81	0.9	10,391	72.5
LABS	7,563	41.4	36	0.6	7,599	42.0

* - $ Millions

As of 30 September 1976.

Source: DARCOM (Capt. Keating), Telecon 5 January 1977.

TABLE II-2
PEP STATUS AS OF
30 JUNE 1976

Assigned to	Packages	Items	Acquisition cost
Army	202	32,114	$570,575,166
Navy	31	6,049	120,682,538
Air Force	25	8,448	166,886,379
DSA	4	650	4,124,657
Totals	262	47,261	$862,268,740

Source: DSA - Industrial Resources and Preparedness Planning Division

ARRCOM has 172 assigned PEP's, which is about two thirds of all the DOD PEP's, thus highlighting the key role played by the PEP concept in munitions production planning.

2. DIPEC Data

a. Distribution

Table II-3 lists the 75 planned producers by state and the recorded quantities of Government-owned and PEP-assigned industrial plant equipment at each plant. Table II-4 presents similar data for the X-facilities; i.e., former planned producers who have left the base and whose PEP equipment has not yet been reassigned.

Approximately 48 percent of the total is assigned to active producers, 26 percent is designated as X-facilities, and the remaining 26 percent is assigned to inactive producers. Therefore, slightly more than one half, or 52 percent of the total IPE, is relegated to either cold base or X-facility status.

Small-caliber ammunition producers have been assigned about 10 percent of the IPE associated with munitions metal parts manufacture. Producers of fuzes have about 31 percent, and other metal parts producers have the remaining 59 percent. No small-caliber ammunition PEP's are currently in X-facility status.

b. PEP-Assigned versus Non-PEP Government-Owned Equipment

Government-owned IPE associated with the PEP's reviewed in this study totals more than 13,000 pieces, of which about 35 percent is in Government central-storage facilities. About 28 percent of this total is not specifically assigned to a PEP, but may be associated with a PEP producer as follows:

- Planned for use in connection with a PEP.
- Currently in an idle status with potential for future or mobilization requirement.
- In use for current procurement.

TABLE II-3

PEPS AND PEP PRODUCERS BY STATE, FOR
75 ARMY MUNITIONS METAL PARTS PEPS
(EXCLUDING X-FACILITIES)

State	City (1)	Planned Producer (2)	PEP Number (3)	Status (4)	IPE Quantities PEP (5)	IPE Quantities Total (6)
Alabama	Gadsen	General Time	757	Active	23	23
	Gadsen	Etowah Mfg. Co. Inc.	773	Inactive	49	70
Arkansas	Camden	Baldwin Electric Corp.	819	Inactive	2	2
California	Vernon	Norris Industries	098	Active	188	306
	Anaheim	Lear Siegler Inc.	208	Active	13	68
	Long Beach	Silent Industries	457	Active	191	252
	Costa Mesa	Wells Marine Inc.	465	Active	61	70
	Irvine	Miller, Barry L. Eng. Co.	721	Active	10	10
	Anaheim	Northrup Electro	740	Active	250	567
	Santa Clara	FMC Corp.	742	Inactive	156	446
	Van Nuys	Marquardt Corp.	817	Inactive	5	269
	Torrance	Martin Marietta	842	Inactive	58	362
Colorado	Denver	Chaparral Ind. Inc.	832	Inactive	43	46
Connecticut	Watertown	Timex Corp.	196	Inactive	648	656
	Waterbury	Scovill Mfg. Co.	463	Inactive	49	72
	Meridan	International Silver	591	Inactive	8	8
	Thomaston	Plume and Atwood	598	Inactive	11	11
	Bridgeport	Remington Arms Co.	724	Inactive		
	Thomaston	Gen Time--Westclox	758	Active	153	161
Florida	Orlando	Dayron Corp.	759	Inactive	41	155
Illinois	E. Alton	Olin-Mathieson	069	Active	105	105
	Bellwood	Borg Warner	072	Active	3	3
	Chicago	American Home Products	200	Inactive	39	39
	Elk Grove	E. Walters Inc.	219	Active	14	14
	Peru	Gen Time-Westclox	436	Active	268	326
	Chicago	Peerless of America	574	Inactive	179	179
	Rolling Meadow	Gen Time - Space Systems Div.	777	Active	58	58
	Marion	Olin-Mathieson ESD	787	Inactive	7	16
	Chicago	Bell & Howell	799	Inactive	69	69
	Marion	Olin-Mathieson ESD	801	Active	7	16
Indiana	Indianapolis	National Dist. & Chem. Co.	071	Inactive	27	27
	Lebanon	Stewart Warner Corp.	571	Inactive	128	144
	Indianapolis	Remco Hydro. Inc.	767	Inactive	11	11
Iowa	Newton	Maytag Co.	083	Inactive	159	159

State	City (1)	Planned Producer (2)	PEP Number (3)	Status (4)	IPE Quantities PEP (5)	IPE Quantities Total (6)
	Waterloo	Chamberlain	455	Active	474	482
Kentucky	Cattlettsburg	Calgon Corp.	722	Inactive	8	8
Louisiana	New Orleans	Rheem Mfg. Co.	167	Inactive	75	75
	Shreveport	Norris Ind. Inc.	744	Inactive	39	39
Maryland	Baltimore	Catalyst Res. Corp.	430	Inactive	49	76
Massachu-	New Bedford	Chamberlain	422	Active	460	502
setts	Attelboro	Texas Instruments Inc.	818	Inactive	9	9
Michigan	Jackson	Kelsey Hayes Co.	643	Active	111	111
	Plymouth	Assoc. Spring Corp.	651	Inactive	15	15
	Detroit	Revere Copper & Brass	804	Inactive	17	45
Minnesota	New Brighton	Honeywell Inc.	600	Active	423	649
	Anoka	Fed. Ctg. Corp.	732	Active	11	11
	St. Paul	Gould Inc.	811	Inactive	9	9
Missouri	St. Louis	Jackes Evans Mfg. Co.	065	Active	13	13
	St. Louis	Kisco Co. Inc.	753	Inactive	--	--
	St. Louis	Kisco Co. Inc.	768	Active	64	138
Nebraska	Ft. Calhoun	Wilkinson Mfg. Co.	786	Inactive	11	14
New Jersey	Mt. Laurel	Alcotronics	771	Inactive	3	4
	Wayne	REDM Corp.	780	Active	48	103
New York	Valley Stream	Bulova Watch S&I	763	Active	2	21
	Valley Stream	Bulova Watch Co.	782	Inactive	--	--
	Buffalo	Anaconda American Brass	805	Inactive	3	3
Ohio	Columbus	Clark Grave Vault	085	Inactive	97	97
	Cleveland	Weatherhead Co.	589	Inactive	194	194
	Galion	Galion Amco Corp.	762	Active	18	19
	Cincinnati	KDI Corp.	843	Active	60	65
Pennsyl-	Lancaster	Hamilton Technology	399	Active	114	867
vania	Philadelphia	Action Mfg. Co.	489	Active	5	5
	Red Lion	Flinchbaugh Products	602	Active	171	289
		MSL Ind/Garrett	656	Inactive	9	9
	Wilkes-Barre	Medico	766	Active	22	60
Rhode Island	Warwick	Bulova Watch ASD	781	Inactive	86	88
South Carolina	Conway	American Gear & Pinion	794	Active	13	207
Tennessee	Nashville	Temco Inc.	227	Active	32	57
	Dyersburg	Heckethorn Corp.	866	Active	--	--
Vermont	Bennington	Union Carbide Corp.	810	Inactive	124	139
Wisconsin	Eau Claire	National Presto	459	Active	381	452

State	City (1)	Planned Producer (2)	PEP Number (3)	Status (4)	IPE Quantities PEP (5)	Total (6)
	Milwaukee	Controls Comp. of America	580	Inactive	9	9
	Waukesha	Amron	737	Active	168	191
	Waukesha	Amron-Ritepoint	748	Active	166	411
	Janesville	Gibbs Mfg. & Res.	749	Inactive	15	16
TOTAL			75	35	6,561	10,222

TABLE II-4

PEP X-FACILITIES BY STATE FOR
ARMY MUNITIONS METAL PARTS

Location	Former Producer	PEP Number	IPE Quantities PEP	IPE Quantities Total
Illinois	Revere Copper & Brass	095	115	115
Massachusetts	Ward Machine Co.	166	12	12
Connecticut	McGraw Ed/Ingraham	192	72	72
Pennsylvania	Kennedy-VanSaun Mfg.	204	114	120
Pennsylvania	Lansdowne Steel & Iron Co.	211	248	248
Louisiana	Delta Southern	217	114	114
Ohio	G.D. Roper	221	112	112
Michigan	Gulf & Western	230	109	109
Iowa	John Deere	418	89	89
Iowa	Dunham Bush	420	112	112
Connecticut	Alcan Alum Corp.	423	30	30
Ohio	Zeller Corp.	437	44	44
Connecticut	Olin Mathieson Chem.	461	364	368
Illinois	Zenith Radio Corp.	468	82	82
Pennsylvania	Budd Comp.	570	166	166
Alabama	Alabama Industries	596	116	156
Arkansas	Ambac Industries	620	105	105
Michigan	Chrysler Corp.	630	138	138
Indiana	Avco Corp. Prec. Prod.	670	607	618
California	Aerojet Ord. Mfg. Co.	720	280	280
Massachusetts	Waltham Prec. Instru.	734	24	24
Ohio	Lear Seigler (Plant 1)	736	3	3
Tennessee	Airport Mach. Corp.	746	65	65
Utah	Murdock Mach. & Eng.	791	233	354
Michigan	Hayes Albion	795	30	30
Total		25	3,384	3,566

In any case, a significant amount of IPE is outside of the strictly PEP-assigned inventory. In terms of Government-owned IPE physically located at the producer's plants, non-PEP IPE constitutes more than 40 percent of the total quantity. This equipment should be held pending determination of use.

c. Government Storage Locations

Government storage is located at 22 sites in 15 states, as shown in Table II-5. Many PEP's have IPE dispersed in several locations; active PEP's are sited in up to 10 locations, inactive PEP's in up to 11 locations.

It may be worthwhile to review the feasibility of consolidating storage locations in the interest of efficient maintenance and management.

d. Operating Status

Approximately 38 percent of the IPE is in active status, reserved, or on loan; approximately 60 percent is in departmental reserve awaiting issue, in PEP storage, or used intermittently. The remaining two percent is in transit status or undergoing disposal.

Status Code 1 (i.e., active IPE) does not necessarily imply that the IPE is operable.

e. Equipment by Type

Turning-and-boring equipment constitutes 35 percent of the total IPE; presses account for 13 percent. The special machines and miscellaneous category includes all IPE not assigned to the other types and totals almost 3,000 items; over half of these are stored at Government facilities. The benefits of reducing the inventory of special-purpose equipment could include savings in storage, maintenance and management. This could justify a review to determine retention or replacement by standard equipment.

There should be a means of cross-referencing special machines and miscellaneous equipment back to standard equipment.

TABLE II-5
GOVERNMENT STORAGE LOCATIONS FOR IPE FROM PEP'S
ARMY MUNITIONS METAL PARTS

State	Storage Location	No. of PEP's	Pieces of IPE
Alabama	Anniston Army Depot	1	2
Arkansas	Pine Bluff Arsenal	1	1
California	Tracy Def Depot	36	151
Illinois	Joliet AAP	9	283
Indiana	Navy Wep Spt Ctr	4	4
Indiana	Newport AAP	3	59
Iowa	Iowa AAP	10	68
Kansas	Atchison DIPEF	49	636
Kansas	Kansas AAP	4	9
Kansas	Page Airways, DIPEF	3	4
Maryland	Edgewood Arsenal	3	13
Michigan	Pontiac Storage Fac	33	327
Minnesota	Donovan TCAAP	2	2
Minnesota	Twin Cities AAP	5	85
Missouri	Lake City AAP	1	3
New York	Seneca Army Dep	44	1,186
Ohio	Def Const Sup Ctr	42	321
Ohio	Ravenna AAP	29	1,062
Pennsylvania	Mechanicsburg, Def Depot	42	521
Pennsylvania	Scranton AAP	1	1
Pennsylvania	Letterkenny A Depot	1	2
Utah	Ogden Def Depot	1	1
			4,741

Source: Count of industrial plant equipment by state for related PEP's - 1/8/76.

f. Equipment Condition

Recent Government assessment of representative inventories of PEP equipment has indicated significant instances of inaccurate condition ratings, with over 40 percent in worse condition and approximately nine percent in better condition than rated.

The effect of erroneous PEP equipment condition ratings may be accented because some planned producers use more than 50 percent Government-owned equipment for production of munitions metal parts; several planned producers use up to 100% Government-owned IPE.

It is concluded that the total capability of PEP's to meet mobilization assignments is indeterminate until all equipment has been assessed. This task has been initiated in the PEP Modernization Program.

3. Equipment Retention Modes

A hot or warm base, by definition, has achieved startup. A cold base will generally require a minimum of 12 months for startup. However, if all required equipment and tooling are in place (at the producer's facility), connected to power, and exercised at regular intervals by a trained cadre, startup could be assumed to occur within approximately four months. If all equipment is in place but not under power, startup would require about nine months.

A significant conclusion of the equipment layaway study (PEP Modernization Program Task B-4) is that, considering economics alone, it will cost more to produce and stockpile the requisite authorized acquisition objective for a planned item with a cold base than to assign the particular item to a hot or warm base with a correspondingly lesser authorized acquisition objective.

Other considerations affecting the efficacy of the cold base are that: (a) it assumes the integrity of national transport to ship widely dispersed PEP's; (b) it requires layaway in at least 0-2 condition; (c) the production capability is essentially limited to that existing at the time of layaway, and; (d) producer interest is low because of lack of peacetime production.

The cold base encompasses inactive PEP's and X-facility PEP's; these are all laid away. Because the operational condition of this stored equipment is unknown and probably marginal (the vintage extends in some cases back to World War II), its usefulness for munitions production upon activation requires validation.

4. Resources/Requirements Analysis

The preceding subsection C highlighted ARRCOM's mobilization planning task, with the goal of achieving effective management of the munitions production base, including the best practicable utilization of the $840 million (original acquisition cost) Government-owned IPE inventory, in the light of constantly changing planned item requirements.

To achieve the goal of effective base management, there is a critical need for a means of comparing planned item production requirements to these various types, quantities, and conditions of IPE available in the industrial base. This comparison requires IPE data from all privately-owned equipment that is relevant to munitions production, as well as Government-owned IPE in both the private and public sectors. The needed quantitative analysis should provide the essential elements of information for timely decisions by ARRCOM on allocating IPE in response to the Production Base Plan.

These decisions would be pertinent to the following:

- Allocation of IPE to a given planned producer.
- Adequacy of the production base capability for a particular planned item.
- Impact on planned items or production base that would be induced by transferring equipment between PEP's.
- Impact on the production base of introducing a new or redesigned planned item.
- IPE availability and condition.

It is not envisioned that the analysis be totally automated, although the expected volume of quantitative data is sufficient-

ly large so that the most practical approach is to use electronic data processing.

Figure II-4, "Resources/Requirements Analysis", illustrates the conceptual approach to an analysis designed to meet the needs outlined above. The approach utilizes the following inputs, as shown in the figure:

- Production requirements for planned items, including PEP's, GOGO's, GOCO's and COCO's.

- A complete inventory of relevant IPE, both contractor and Government-owned, with a current condition assessment of equipment items.

- A manufacturing engineering analysis of each planned item identifying alternative processes and enumerating the types and quantities of IPE needed for a given production rate.

- Identification of individual PEP's, planned items associated with each PEP, and manufacturing processes pertaining to each PEP planned item.

As illustrated in Figure II-4, the analysis is an integrative process, in which the basic operations for a given machine type and capacity are defined by means of "Operation Requirement/ Equipment Capability Modules" (lower left corner) and then assembled, through a sequence of logical steps, to develop a complete overview of the "Base Capability Status Summary" (upper right corner). Concurrent with the data assembly, tradeoff studies identify feasibility and economic guidelines at each stage. The formats shown in Figure II-4 are abridged versions of the suggested data tabulations, which are detailed and described in Subsection VI.E.

It is recommended that this methodology be developed and validated to be compatible with the resource management system.

Using these analytical tools, equipment reassignments, surplusing or acquisition could be effected to support ARRCOM's authorized requirements and to achieve the goal of optimum practicable distribution of equipment resources to meet requirements.

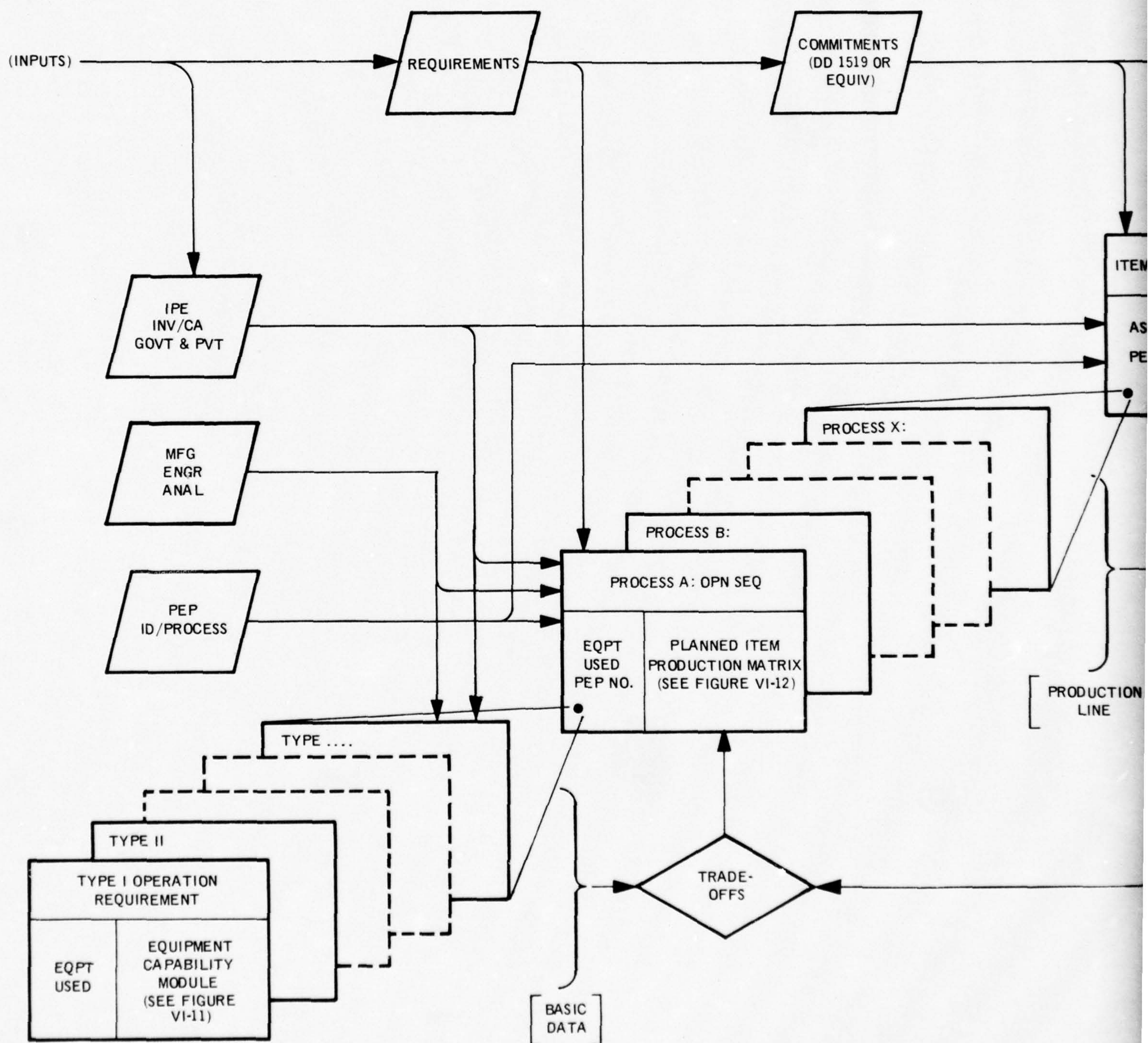
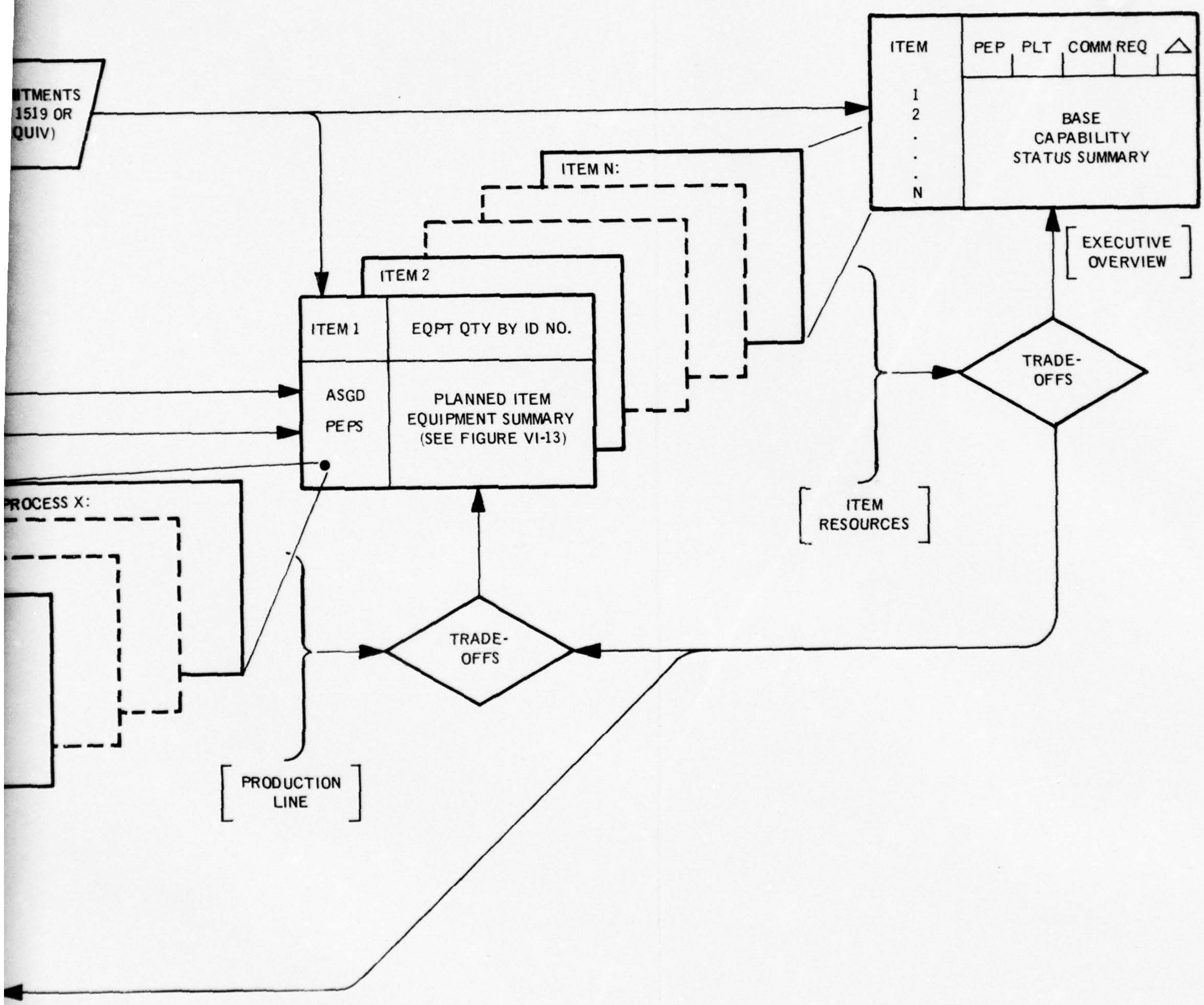

(INPUTS)
REQUIREMENTS
COMMITMENTS (DD 1519 OR EQUIV)
IPE INV/CA GOVT & PVT
MFG ENGR ANAL
PEP ID/PROCESS
ITEM
AS
PE
PROCESS X:
PROCESS B:
PROCESS A: OPN SEQ
EQPT USED PEP NO.
PLANNED ITEM PRODUCTION MATRIX (SEE FIGURE VI-12)
PRODUCTION LINE
TYPE ....
TYPE II
TYPE I OPERATION REQUIREMENT
EQPT USED
EQUIPMENT CAPABILITY MODULE (SEE FIGURE VI-11)
TRADE-OFFS
BASIC DATA

FIGURE II - 4

RESOURCES/REQUIREMENTS ANALYSIS



NOTE: FORMATS DETAILED ON FOLLOWING FIGURES

E. SKILLS

1. Categories

As shown in Table II-6, acquisition of skills needed for munitions metal parts production may require from a few hours of on-the-job training (OJT) for simple tasks, up to 15 or 20 years for a toolroom foreman.

Table II-7 presents Bureau of Labor Statistics (BLS) data for six vocations relevant to the munitions metal parts production program and shows that average annual requirements exceed present annual training output for each vocation. BLS' vocations are much broader than the skill categories used by PBM in their 1976 active producer skills study. Where BLS uses broad categories such as machine tool operators and setup men, the PBM categories are more narrowly defined (e.g., hairspring truers and screw machine setup men).

Skill category shortages are accentuated by pay scale trends which provide little incentive for training. Facilities contracts should have a clause to identify the critical skills and staffing levels committed by DD Form 1519.

2. Decision Analysis

Table II-8, "Decision Matrix - Evaluation of Techniques to Assure Availability of Skilled Personnel", displays 13 solutions to the skills shortages problem; applicable decision elements are shown in the left-hand column; the numerical scores shown in the matrix represent an approximate order of preference ranking developed on a subjective basis. The higher scores reflect more advantageous solutions in terms of benefits to the munitions base, as shown in the following order of preference:

(1) The College/Industry/PEP training program is conceived as a coordinated effort between ARRCOM, other Government agencies, a PEP producer, and a leading polytechnic college in the producer's local area. Figure II-5 diagrams the basic concept of this program. Kingsbury Machine Tool Corporaporation of Keene, New Hampshire, has reportedly met with success in a similar program.

TABLE II-6

SKILL LEVELS NEEDED FOR MUNITIONS PRODUCTION

Skill Category	Typical Training Requirements
1. Operation of simple machines	One week OJT + 90 days close supervision
2. Operation of complex machines	90 days OJT + 1 year close supervision
3. Machining foreman	10 years experience
4. Setup man	2-4 years OJT + 2 years experience
5. Inspectors	
a. Semiskilled	1 week OJT
b. Journeyman	2-4 years OJT
6. Tool and die maker) Tool and cutter grinder)	4 years OJT + 4 years experience
7. Toolroom foreman	15-20 years experience
8. Machine rebuilder	4 years OJT + 4 years experience
9. Engineering	8 years total education and experience

NOTE: The term "simple machines" refers to equipment such as punch presses, grinders, drill presses, and material handling equipment. "Complex machines" designated equipment such as automatic screw machines, gear hobbers, and multistation way machines. "Engineering" includes manufacturing engineering, tool engineering, and metallurgical engineering.

TABLE II-7

SKILLS SHORTAGES
(From BLS Bulletin 1824,
Occupational Manpower and Training Needs, Rev. 1974)

Skill	Average Annual 1972-1985	Present Annual Training Output From Gov't Programs, Vocational Schools, And Apprenticeships	Present Average Annual Deficit
1. Foundry (patternmakers, molders and coremakers)	2,025	276	1,749
2. General machinists	13,100	3,988	9,112
3. Instrument makers (mech.)	200	20	180
4. Machine tool operators	25,600	2,810	22,790
5. Setup men	2,200	543	1,657
6. Tool & die makers	4,200	4,102	98

TABLE II - 8

DECISION MATRIX

EVALUATION OF TECHNIQUES TO ASSURE AVAILABILITY OF SKILLED PERSONNEL

DECISION ELEMENTS

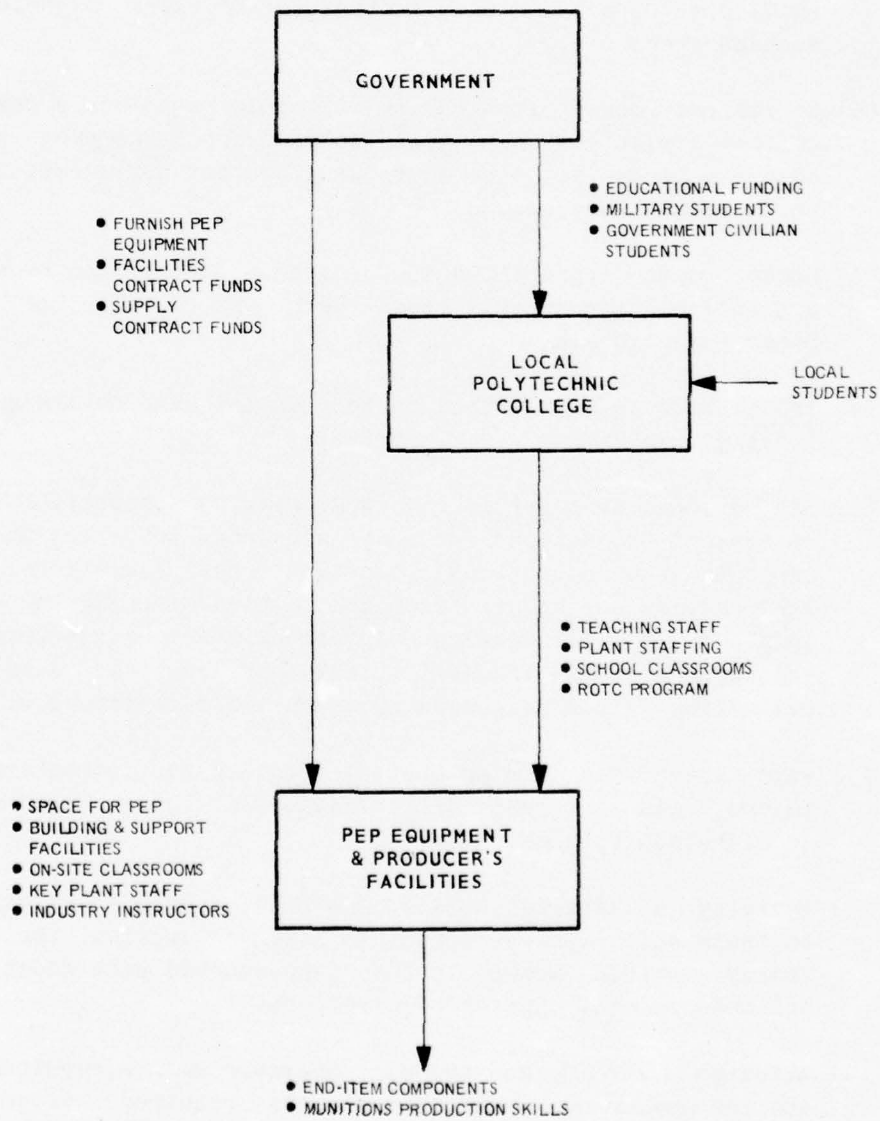
EFFECT ON SKILLS	Holding on to key personnel
	Reduces skill levels required or partially compensates for low skill levels or increases existing skills
	Eliminates dependence on memory
	Reduces manpower requirements
	Attracts skills from other sources
	Expands outside skills pool
	Can be tailored to producers' skill requirements
	Permits training Government personnel in addition to producer's
	Permits screening workers and retaining the best
	Shows where vocational training should be emphasized
TIMING CONSIDER-ATIONS	Applicable to surge requirements
	Applicable to mobilization requirements
	Earlier initial production
	Accelerates startup
	Improves equipment readiness
	Responsiveness to producer's changing manpower demands or reducing impact thereof
COST EFFECTS	Reduces cost to lay away
	Reduces layaway maintenance cost
	Reduces production cost
	Reduces other costs
	Special funding not required
	Producer not involved in funding
	Lowers reject rate
	Tax incentives
	Possibility of non-Army Government funding
MISCELLANEOUS CONSIDERATIONS	Minimizes possible union problems
	Provides visibility of skills pool
	Shows producers with highest skills availability
	Usable for selecting planned producers
	Usable for evaluating producers' bids
	Avoids duplication of BLS program
	Present practicability
	Total Score
	RANK

POSSIBLE SOLUTIONS

	MAXIMUM POSSIBLE SCORE	TRAINED CADRE	BETTER DOCUMENTATION	CAD/CAM	WAGE INCENTIVE	ON-JOB TRAINING	TRAINING AT STARTUP	LOCAL TRADE SCHOOLS	UNION APPRENTICE PROGRAM	COLLEGE/INDUSTRY/PEP TRAINING PROGRAM	RESERVE CORPS	MIS SKILLS REQUIREMENTS/ AVAILABILITY	INITIAL OVERSTAFFING	NATIONAL MP MATRIX
	4	4	0	0	4	0	0	0	0	2	3	0	0	0
evels	4	0	3	4	0	4	4	1	1	4	1	0	3	0
	4	0	4	4	0	0	0	0	0	0	0	0	0	0
	4	1	1	4	0	1	1	0	0	0	0	0	0	0
	2	1	0	0	2	0	0	0	2	1	1	0	0	0
	2	0	0	0	0	0	0	2	2	2	0	0	0	0
	3	3	0	0	1	3	3	1	0	3	3	3	2	0
	1	0	0	0	0	0	0	0	0	1	1	0	0	0
	3	3	0	0	0	1	1	1	0	1	3	0	3	0
	1	0	0	0	0	0	0	0	0	0	0	1	0	1
	4	4	4	4	4	4	4	4	4	4	2	4	4	4
	4	4	4	4	0	4	4	4	3	4	4	4	1	4
	4	4	3	4	4	0	0	1	1	4	2	0	0	0
	4	4	3	4	4	2	0	0	0	4	1	1	4	1
	4	4	0	0	0	0	0	0	0	4	2	0	0	0
act thereof	3	0	0	2	3	2	0	0	3	1	0	0	3	0
	4	3	2	1	4	4	4	4	4	4	3	4	4	4
	4	0	4	2	4	4	4	4	4	4	2	4	4	4
	4	4	3	0	0	1	3	3	1	3	3	3	0	3
	4	4	4	0	4	4	2	4	4	4	4	0	0	4
	3	3	3	0	3	3	1	3	3	2	1	3	3	3
	1	0	0	0	0	0	0	1	1	0	1	1	0	1
	1	1	1	1	0	0	1	0	0	0	0	0	0	0
	1	0	0	0	0	1	0	0	0	1	0	0	0	0
	4	1	0	0	0	4	4	4	4	4	3	0	0	4
	1	0	1	1	0	0	1	1	0	1	1	1	1	1
	4	0	0	0	0	0	0	0	2	1	0	4	0	4
	2	0	0	0	0	0	0	0	0	0	0	2	0	0
	1	0	0	0	0	0	0	0	0	0	0	1	0	1
	1	0	0	0	0	0	0	0	0	0	0	1	0	1
	2	1	1	1	1	1	1	1	1	1	1	0	1	1
	12	12	12	12	12	12	12	12	12	12	10	0	12	10
	100	61	53	48	50	55	50	51	52	72	52	37	45	51
		2	4	8	7	3	7	6	5	1	5	10	9	6

FIGURE II - 5

SKILLS
POSSIBLE SOLUTION
TRAINING PROGRAMS
COLLEGE/INDUSTRY/PEP



(2) The trained cadre is a small team of key people with critical skills who would exercise and maintain each equipment item. Advantages of this concept include retention of the best people, achievement of equipment readiness, early production line startup, and shortened reactivation time.

(3) On-the-job training should be used in conjunction with any of the other solutions.

(4) Improved technical documentation decreases dependence on skilled setup men and permits the use of less experienced machine operators.

(5) A reserve corps for PEP skills would establish a reserve unit at a plant; members would be paid for attending periodic meetings so that continuing contact would facilitate their recall when needed.

(6) Under union apprenticeship programs, unions can bring in apprenticeship graduates from their own locals, or from other union locals.

(7) Trade schools should include courses in basic skills needed locally.

(8) The national manpower matrix (NMM) develops occupational and employment projections for state and local areas to use in manpower and educational planning. When operational, NMM will provide the country with a data base covering the total economy; it will develop projections for approximately 400 occupations in 200 industries, and thus provide data for evaluating skills resources of competing manufacturers.

(9) Wage incentives are an obvious solution for attracting new talent, and are especially adaptable under peacetime acceleration requirements.

(10) Training at startup uses a qualified group with key skills to train sufficient personnel to start production; the initially trained group is then supplemented with additional trainees to meet ongoing requirements.

(11) Although CAD/CAM can decrease operator skills requirements and the number of machine operators required, offsetting

factors include higher costs, larger maintenance staff, and the higher skills required for maintenance of NC equipment.

(12) Initial overstaffing compensates for low skills and low productivity at startup by using more equipment and operators than would normally be required at full production; offsetting are the disadvantages of inefficiency and problems of personnel attrition.

(13) The MIS-Skills Requirements/Availability concept would include use of pertinent skills data in the munitions resource management system to evaluate the skills position of competing manufacturers.

F. ENGINEERING DOCUMENTATION

1. Government-Furnished Documentation

Government-furnished documentation includes technical data packages (TDP), descriptions of manufacture (D of M), and documentation for Government-furnished industrial production equipment.

a. TDP

A complete TDP is the aggregation of all documents referenced by the MIL-SPEC and the TDPL, with revision dates in accordance with the TDPL. The drawings constitute the basic documents of the TDP; the specification is superior in the event of conflict.

Technical data packages are found to be of good quality. Problems experienced are administrative in nature, such as:

- Producer not having TDP.
- Wrong document revision obtained or used.
- Occasional microfilm partially illegible, particularly at the edge.

It is recommended that changes to all technical data, drawings, specifications, etc. be accompanied by a special form for the planned producer to fill out within a specified time

and return to the Government. It should include a review of:

- o Effects on the planned producer's ability to produce.
- o Equipment requirements by types and quantities.
- o Effect on subcontracted items or services, if any.
- o The time and cost for updating the production line.

Facilities contracts should be modified to fund the necessary implementation actions by the planned producers.

KE/SAI modernization teams encountered instances where the item description on a DD 1519 was ambiguous.

b. Description of Manufacture

D of M's are not referenced in technical data packages, because the Government does not dictate the process.

The KE/SAI modernization teams reported only rare instances where producers had ever received a D of M to assist them in mobilization planning or startup of a PEP line.

ARRCOM receives many proposals to prepare D of M's, but the Army has not accepted them for approximately the past ten years because of their high cost.

c. Equipment Documentation Furnished by Government

Equipment documentation of IPE is inconsistent; it should include complete documentation such as handbooks for the equipment, instruction manuals, drawings of the equipment, wiring diagrams, parts lists, maintenance instructions, maintenance records, etc. Frequently, however, equipment is received with incomplete documentation, particularly when it has been loaned previously to another producer.

It is considered that documentation responsibilities should be covered in the "PEP Manual" recommended by this report; the facilities contract could be used as the instrument for update and maintenance of pertinent PEP equipment documentation, and for reimbursement to the producers for this service.

2. <u>Producer Generated Documentation</u>

Producer generated documentation includes process descriptions, plant and equipment layout, and documentation for tooling, quality assurance, production control, maintenance, subcontracts, equipment management, and other aspects of readiness.

Most of the documentation should accompany the PEP to layaway to be available immediately upon activation. The facilities contract can be used to require the contractor to include these documents in the layaway package.

An equipment requirements list or package describes the type, quantity, and production rate capability of equipment required for each operation in the process description. It also indicates which equipment the producer will provide, which is GFE already assigned to the producer, and what voids need to be filled by other GFE.

Quality assurance documentation is found to be the most consistently satisfactory of all documentation generated at producers' plants.

It was noted during KE/SAI plant modernization visits that equipment maintenance records were not always available and those examined were not of consistently high quality. It is recommended that the annual review of the contractor's capabilities include an audit of his equipment maintenance records.

The Government should review subcontract documentation to verify the prime contractor's preparedness planning, and that the planned subcontractor's capabilities will not be exceeded. The results of the subcontract documentation review should be input into the resource management system described in Section X.

When the firm is a supplier to more than one prime contractor, the Government should handle all preparedness planning, contracting, and related documentation directly with that subcontractor and should enter into a facilities contract with the supplier. These actions can validate that the supplier's total capabilities will not be exceeded.

Equipment documentation includes DD Form 1342, "DOD Property Record," and historical records to accompany the equipment upon transfer. Some producers visited by KE/SAI teams kept excellent records; others kept records only on Government IPE; a facilities contract clause could be used to meet this requirement.

Other producer generated documentation includes facility management and maintenance data; data and drawings on utilities available and required for mobilization; plans for changeover from civilian products to mobilization; and skills requirements, manpower projections, and skills acquisition plans.

Producer generated documentation collectively constitutes the backup needed for dependable IPP. Frequently, however, it is found to be inadequate; it is particularly poor where the plant has not produced a planned item for a number of years. If funding of IPP is included in the facilities contracts, producers can be required to generate the documentation needed for thorough advance planning.

A list of required documentation for adequate IPP is contained in Section VIII.

3. Configuration Management

Configuration management applies technical and administrative direction and surveillance to:

- o Identify and document the functional and physical characteristics which constitute the configuration of hardware, software, or a system.

- o Control changes to those characteristics.

- o Record and report on the status of the processing and implementing of the changes.

PBM has prescribed a configuration management program in PBM OSM 70-1, "Configuration Management Operating System Manual," dated 1 April 1976. This directive requires close adherence to achieve the maximum benefit from PEP and plant modernization.

G. DIRECTIVES

Thirty-seven (37) Government directives of direct relevance to PEP's were examined to determine their general interrelationships and to identify those points of conflict that could induce difficulty in their interpretation. The basic finding of the study was that the overall content of the directives is sufficient for PEP management, but that the fragmentary and distributed character of pertinent provisions does not lend itself to an effective implementation. Further, points of conflict in definition and wording were identified.

A "PEP Management Manual" to integrate and clarify the directives is recommended.

H. RESOURCE MANAGEMENT SYSTEM

1. Elements of the Problem

The elements of the problem of resource management can be described in terms of response, methods, and data.

- Response Problems

  Industrial Preparedness Planning is a dynamic, constantly changing task. Keeping the production base synchronized with the changing requirements presents a major problem for ARRCOM. The selection and shifting of resources to react to changing scenarios or to meet an actual mobilization crisis are seriously handicapped by the delays inherent in current manual systems for evaluating alternatives and developing plans.

- Methods Problems

  Current Army production resources inventory methods are inadequate in the following respects.

  - All equipment needed for production is not recorded, including GFE that is not PEP-assigned, producer-owned equipment, IPE with less than $1,000 acquisition cost

  - Physical inventories, which include condition assessments, are not performed frequently enough

- Current inventory records do not relate equipment to the items the equipment is capable of producing

- The element of control appears to be weak in the management cycle in some cases, possibly caused by the slowness of manual methods.

o <u>Data Problems</u>

All the data needed to make accurate and timely preparedness plans are not available. The DIPEC inventory listing is one source that is currently expanding, in the form of the Plant Equipment Package Management Information System (PEPMIS). The major shortcoming of PEPMIS is that it is primarily an inventory file rather than a system to assist in managing plant equipment.

Another problem is one of control over the integrity of the data being supplied to the data bank. Computer assistance in this area can be valuable in the form of systems that prevent the entry of incorrect data, preferably at the time the entry takes place. Currently, the Army has no system for industrial preparedness planning that addresses the collection of reliable data on a continuing basis.

2. <u>Required System Functions</u>

System functions needed by the resource management system include:

o <u>Monitoring of producer capabilities</u>.

All producer related information required for industrial preparedness planning must reside in the data bank used by the resource management system.

o <u>Monitoring of inventory of finished goods, skills and equipment</u>.

Again, all data relevant to the readiness of the production base must be included in the data bank. The capability must exist to identify voids, multiple-use equipment, and equipment with undercapacities.

- <u>Programs and subsystem functions</u>.

  The system must have the capability to analyze all factors pertinent to the selection of producers both for current production and for mobilization production. The ability to relate planned item requirements to producer capabilities is a key consideration in providing this function:

  - The planning processes should be automated wherever practicable

  - An interface capability between the data bank and the analytical tools being developed by JCAP and ARRCOM is needed

  - The resource management system must respond to many changes rapidly enough to make corrective decisions and allow those decisions to be implemented

  - Compatibility should be maintained between the resource management system and other systems used by various commands, for reporting readiness and other required information to the top policy-making levels

  - The system should permit analysis of the impact of alternative decisions before implementation.

3. <u>Possible Courses of Action</u>

It is concluded that increased computer assistance is needed for resource management. Therefore, the following discussion of possible courses of action does not consider the choice of doing nothing; it deals, instead, with achieving the goal of a total resource management system through alternate ranges of implementation activity.

a. Design a single system for all levels of management and all commands involved with industrial preparedness planning and then implement the system, one command at a time. However, to implement a system on such a large scale is not considered practical.

b. Design a system for a single command, ARRCOM in this case, and implement it for GOCO's and GOGO's, then for COCO's.

This approach is disadvantageous in that it does not consider all areas of industrial preparedness planning until total implementation is accomplished.

c. Design a system for managing PEP's and implement it by planned items or logical groupings of items. The scope of such a system would probably be too narrow, as PEP's are only one of several factors involved in the munitions production base.

d. Design a system for ARRCOM, as stated in b. above, and implement it by planned items or logical groupings of items. A more practical scope of activity would be maintained, and concurrently all aspects of industrial preparedness planning, from the bottom to the top levels of management, would be served, beginning with the initial implementation.

4. Recommended Course of Action

An effective resource management system requires a scope beyond that of PEP's for munitions metal parts production in the private sector because propellants and explosives, fuzes, load, assemble and packing operations, and the warehousing and shipping of finished products must all be considered. Furthermore, the basic management functions of planning, execution, and control through all levels of industrial preparedness planning management need to be integrated.

Figure II-6 represents the scope of the recommended design activity in terms of a vertically oriented functional approach. The shaded area represents the function of managing industrial preparedness of the munitions base; i.e., the area the resource management system should be designed to serve. It is vertically oriented, in that it provides for the flow of information through all levels of management concerned with the function. Figure II-6 also illustrates the relationship of PEPMIS to the resource management system in terms of the scope of information involved.

An overview of the recommended resource management system is illustrated in Figure II-7, showing the relationship of the various agencies to the data bank and to the information flow.

FIGURE II - 6

SYSTEM DESIGN SCOPE

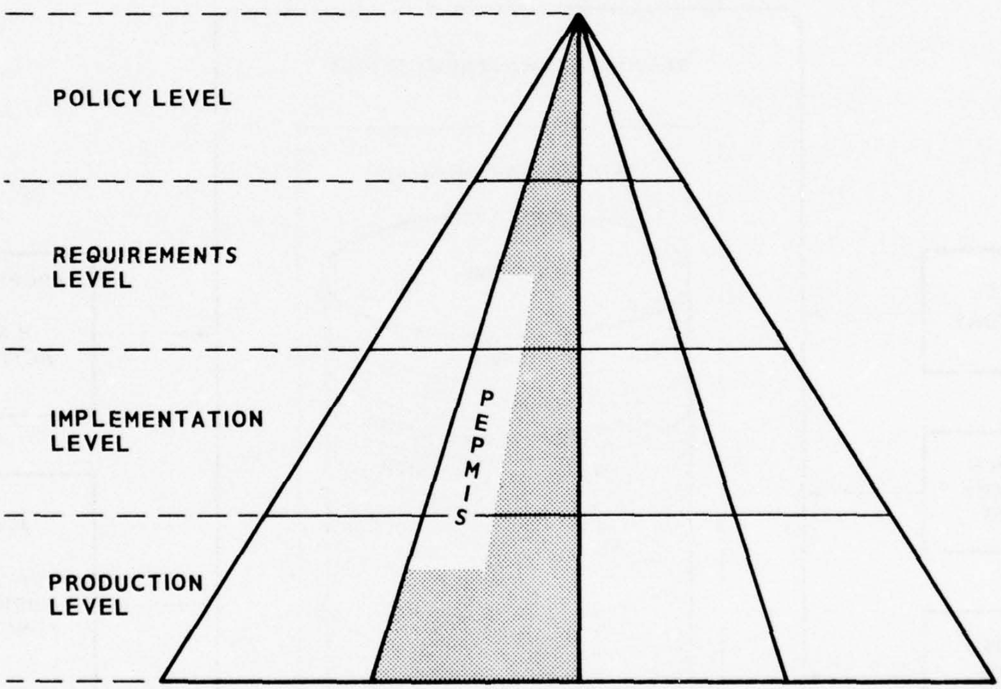
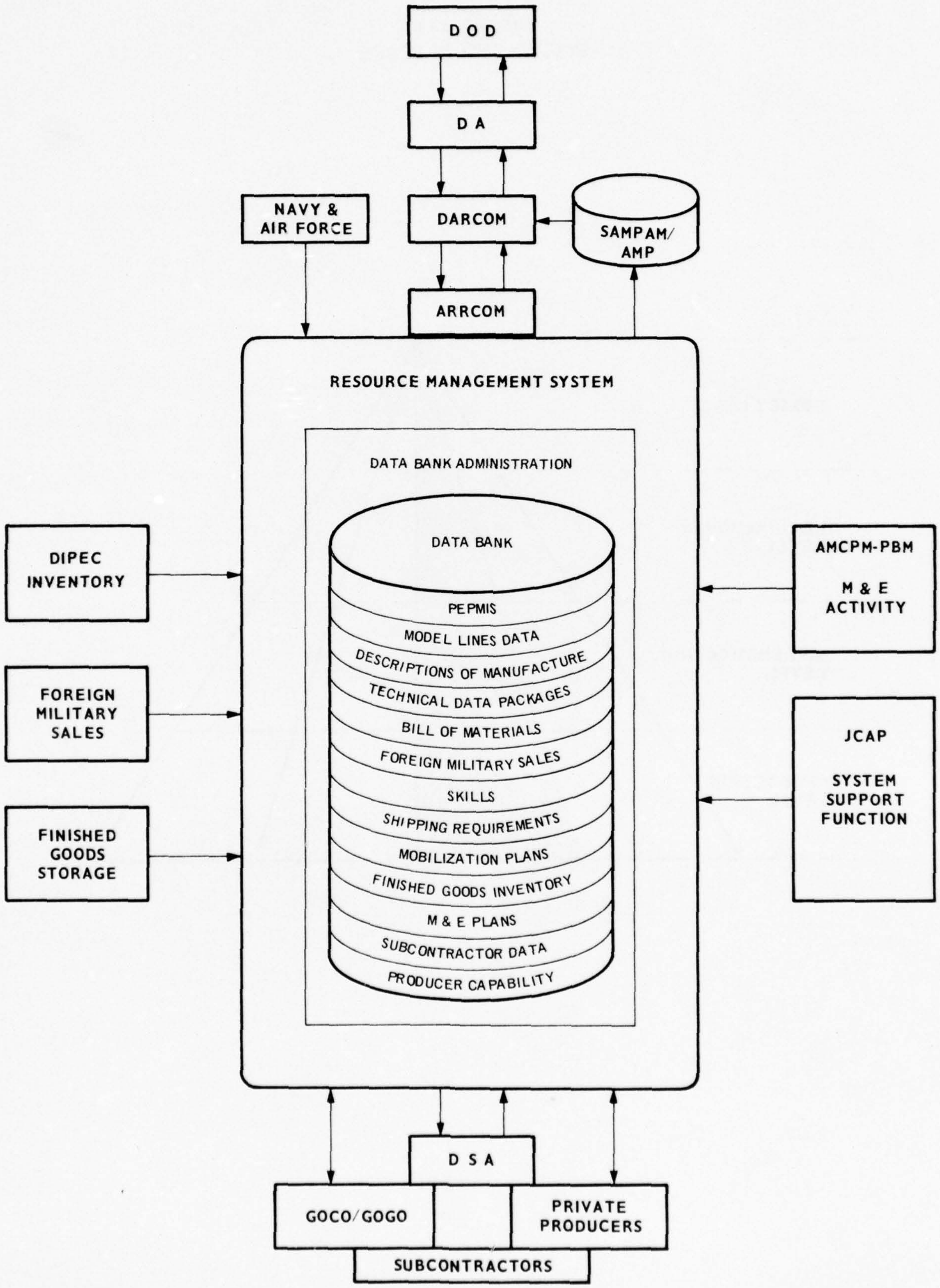


FIGURE II - 7

DATA BANK CONCEPT



At the center of the system is the data bank that contains the numerous bodies of information necessary for industrial preparedness planning management; these are shown as separate files. In the actual system, this information will be linked together logically. Eventually, the data bank should appear to the users of the system as a single, integrated collection of data.

The important function of data bank administration should be responsible to, if not under the direct control of, the primary system user, ARRCOM. The area surrounding the data bank administration function represents ARRCOM's industrial preparedness planning and execution. It shows requirements information coming into the system from DARCOM and readiness reporting flowing back up to the top policy levels of the Army, along with input for SAMPAM and AMP returning to DARCOM. At the bottom of Figure II-7 is the production level represented by private sector producers, the GOCO's/GOGO's, and the subcontractors.

Other production base management activities to be provided by the resource management system include:

(1) Select planned producers.
(2) Detect mobilization bottlenecks.
(3) Generate cash flow and budget analysis.
(4) Produce detailed startup critical path methods.
(5) Control finished goods inventory.
(6) Evaluate the impact of alternative priority selections.
(7) Produce shipping schedules for planned items.
(8) Analyze facilities.
(9) Establish rehabilitation/modernization priorities.
(10) Determine maintenance priorities and schedules.
(11) Maintain skills inventory.

It is recommended that a team be established to determine all information requirements and then continue as the nucleus of the subsequent detailed design and implementation effort.

Section X contains details of the tasks involved in the system design and implementation together with its potential application in solving a typical problem.

The next subsection describes the recommended implementation of the system and its interface with the other defined tasks required to upgrade management of the munitions production base.

I. IMPLEMENTATION OF RECOMMENDATIONS

1. General

The diversity and detail of content in the body of the report give rise to an extensive set of conclusions and recommendations, as presented in Section III, A-F, inclusive. The salient feature of the recommendations is that, although wide-ranging, they are intrinsically inseparable. That is, no single area of the recommendations can be effectively implemented without drawing on information developed in response to other recommendations. The desired end result is the resolution of existing problems and correction of deficiencies identified in the munitions production base, so as to achieve a common objective:

- "Modernization of the Munitions Production Base Management System."

The basic premise of this objective is that a systematic and integrated approach is essential, for the following primary purposes:

(1) Provide the context for an improved response to both the dynamic nature of the munitions production base capabilities and the requirements (also variable) levied upon it, whether plannning for mobilization, meeting authorized acquisition objectives, or planning for peacetime surge and acceleration.

(2) Recommend an outline program, also to be a system design, to provide an organizational, procedural, and information management framework for bringing the modernized management system "on-line".

To emphasize the integral nature of the proposed program, KE/SAI recommend that two project entities be constituted by DARCOM:

- A "Steering Committee" composed of representatives from DARCOM, ARRCOM and PBM.

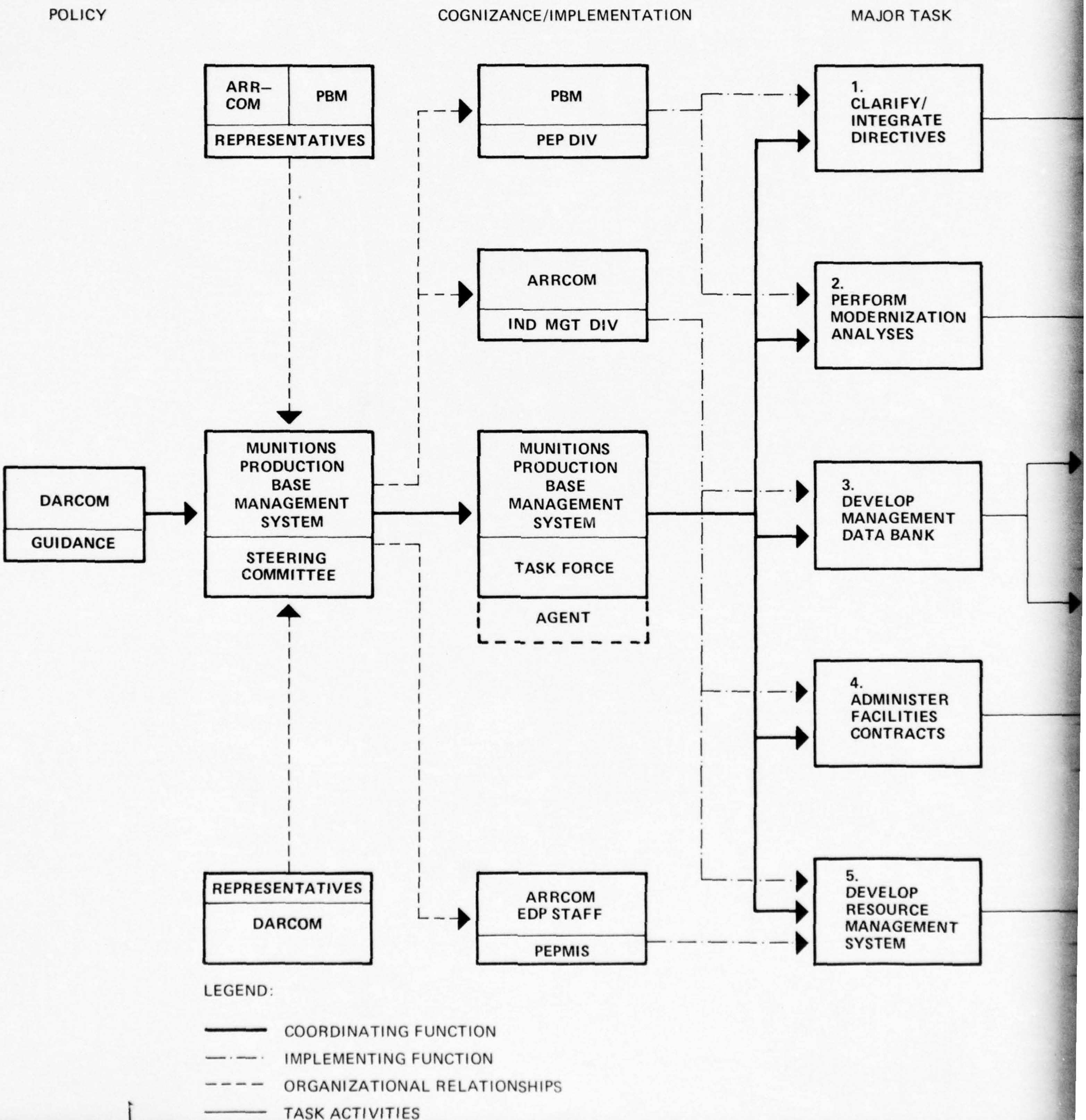
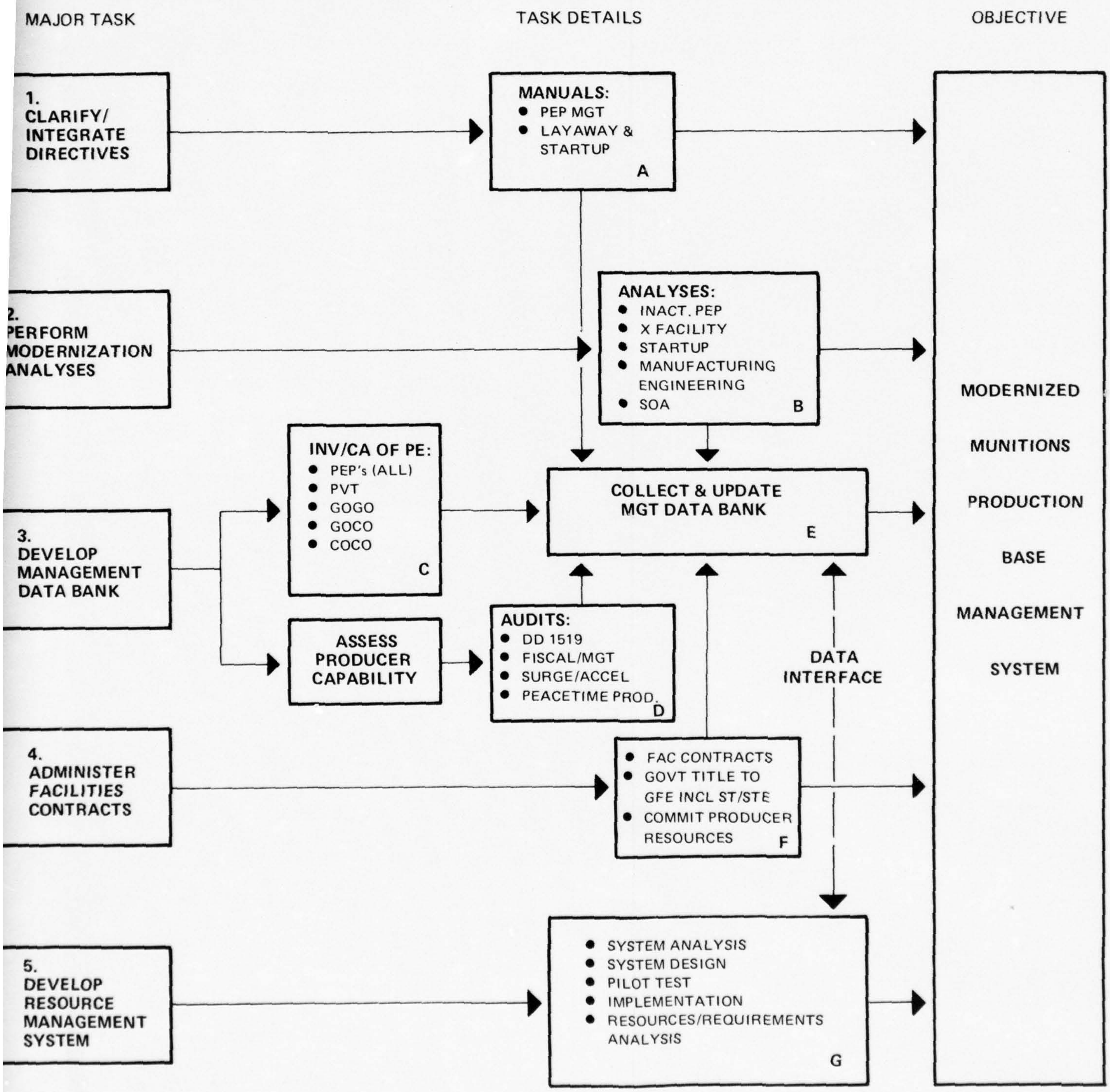

POLICY
COGNIZANCE/IMPLEMENTATION
MAJOR TASK
ARR–COM
PBM
REPRESENTATIVES
PBM
PEP DIV
1. CLARIFY/ INTEGRATE DIRECTIVES
ARRCOM
IND MGT DIV
2. PERFORM MODERNIZATION ANALYSES
DARCOM
GUIDANCE
MUNITIONS PRODUCTION BASE MANAGEMENT SYSTEM
STEERING COMMITTEE
MUNITIONS PRODUCTION BASE MANAGEMENT SYSTEM
TASK FORCE
AGENT
3. DEVELOP MANAGEMENT DATA BANK
4. ADMINISTER FACILITIES CONTRACTS
REPRESENTATIVES
DARCOM
ARRCOM EDP STAFF
PEPMIS
5. DEVELOP RESOURCE MANAGEMENT SYSTEM
LEGEND:
COORDINATING FUNCTION
IMPLEMENTING FUNCTION
ORGANIZATIONAL RELATIONSHIPS
TASK ACTIVITIES

FIGURE II - 8

MODERNIZATION OF THE MUNITIONS PRODUCTION BASE MANAGEMENT SYSTEM



2

- o A "Task Force" drawn from Government and civilian contractor personnel as appropriate.

These two project entities are shown in Figure II-8, "Modernization of the Munitions Production Base Management System," in the context of their respective functions:

- o The Steering Committee provides policy guidance and oversight.

- o The Task Force coordinates detailed implementation of the program.

The Task Force approach will assure that the overall project is conducted in a consistent and coherent manner; in particular, the body will be in a position to preclude duplication of effort or development of redundant data by ensuring an integrated effort by the various commands. The commands will, as shown in Figure II-8, pursue certain major tasks, each of which incorporates subsidiary detailed tasks. These detailed tasks are shown to be mutually interdependent, and hence require a coordinated approach. The suggested apportionment of tasks is based on KE/SAI's present perception of DARCOM organization and missions. A description of these major and subsidiary tasks is contained in the following paragraphs.

2. PBM/PEP Division Tasks

a. Task 1. Clarify/Integrate Directives

The output of this task is two manuals, designated as Subtask A, both designed to contain all information pertinent to their use. In the development of the manuals, inconsistencies and ambiguities within and among the pertinent directives will be identified and resolved. One of the manuals is a "PEP Management" manual, containing the policy statements, directives, and other instructions necessary for the effective management of PEP's; of particular utility will be the incorporation of relevant portions of the guidance documents by extract or paraphrase, to obviate the present difficulties engendered from "incorporation by reference" when the user is not on the distribution list for a particular document. The other manual is a "Layaway and Startup" manual that would also

reflect the conceptual design approach of the PEP management manual. In the "Layaway" portion of this manual, particular attention will be given to equipment rehabilitation at layaway, thus alleviating the void problem at startup.

Implementing these manuals will also provide a substantial increment of information to the Management Data Bank (Task 3); in addition, the "PEP Manual" will supply guidelines for design of the Resource Management System (Task 5).

b. Task 2. Perform Modernization Analyses

This task extends the current PEP Modernization study by expanding the scope to incorporate inactive PEP's and X-facilities as shown in Subtask B. In addition, the impact on startup time consequent on production automation and mechanization for planned items should be considered. The final topic recommended is detailed manufacturing engineering analyses for planned items (not model lines), identifying and evaluating feasible alternative production processes. All analyses should incorporate state-of-the-art considerations and currently forecasted technology upgrading. The outputs of these studies will also be included in the Management Data Bank.

3. ARRCOM Industrial Management Division Tasks

a. Task 3. Develop Management Data Bank

The data bank is a central constituent of the modernized munitions production base management system. In the absence of timely and valid information, the utility of planning and allocation would be, at the minimum, compromised. Consequently, parallel and interrelated subtasks are recommended.

Subtask C is a comprehensive inventory and condition assessment (CA) of all plant equipment in, or available to, the production base. This is construed to incorporate special tools (ST), special test equipment (STE), and other plant equipment (OPE) critical to the production of munitions planned items in addition to the industrial plant equipment (IPE) associated with production processes. A consistent and effective accretion of data will not be achieved if, in

addition to the PEP's (of all classes; active, inactive, X-facility), GOGO's, GOCO's, and privately held inventories relevant to munitions production are not considered. The latter is crucial; as PEP's are complementary to privately held IPE, the existence of voids could not be otherwise determined. Allocation of planned item production quantities would be questionable without these data as would also, and inevitably, delays in startup.

Supplementary to the inventory/CA, the capabilities of planned producers in the private sector should be audited, and steps taken to ensure that resources are effectively committed, as shown in Subtask D. Such audits must be comprehensive, covering technical and management capability for planning as well as production and all other factors pertinent to bringing the planned producer on-line. The previous production history of the producer and fiscal stability should also be considered, taking into account peacetime production and potential requirements for surge or acceleration.

The final Subtask (E) is to collect and update the data incorporated in the Management Data Bank. This draws upon all data sources identified in the "modernization" recommendation, and closely interrelates to the design and development of the Resource Management System. The latter is significant, as compatibility of input/output formats is essential. In addition, a data item may be obtained from more than one source; means of correlation are required, as well as a method of eliminating redundant files while retaining recall capability.

Input formats should be specified by the data bank manager, and a recommended policy for updating should be formulated.

b. Task 4. Administer Facilities Contracts

Production commitments from the private sector can be enhanced by invoking facilities use or consolidated facilities contracts including, where practical, compensated mobilization planning as shown in Subtask F. This would be done for the purpose of retaining selected planned producers in the base.

Related to the above, but separately treated in Subtask F, assurance of the availability of ST/STE is necessary. This can be done by securing Government title to the equipment; jointly with a facilities contract, necessary maintenance and design (of planned item) upgrading can be performed.

c. Task 5. Develop Resource Management System

This task, as detailed in Subtask G, is performed jointly with ARRCOM EDP staff, to ensure the incorporation of existing programs, such as PEPMIS. All data developed for the modernized munitions production base management system will be input, stored, processed, and output using the Resource Management System. The system provides the key to effective modernization of the munitions production base management system, and will be a vital tool for industrial preparedness planning.

It is recommended that an intensively controlled acquisition process be used in bringing the system on line. This process should include: detailed design review at selected steps; comprehensive documentation for programming, operations and maintenance, and; a scope-and-time-sequenced series of validation and acceptance tests.

After acceptance of the basic Resource Management System, a primary add-on should be an algorithm to implement the Resources/Requirements analysis described in Section VI.E.

III. CONCLUSIONS AND RECOMMENDATIONS

A. INDUSTRIAL PREPAREDNESS

1. Conclusions

a. PEP Concept

1) Because of the unique nature of munitions manufacture and the low peacetime production requirements, PEP's are considered essential for private firms to be able to provide an immediate response to produce munitions in the event of a national emergency.

2) Implementing the PEP concept has enabled the Army to retain and allocate approximately $600 million (initial acquisition cost) of industrial plant equipment for improving industrial preparedness; this equipment retention authority constitutes a vital element in the nation's total munitions production capability.

3) The PEP concept was eminently successful during the Southeast Asia conflict in ensuring the availability of an industrial production capability to meet requirements for national defense; lead times for munitions production were reduced from the 12-18 months experienced in Korea to 6-9 months for the Vietnam buildup.

4) Although a viable base of planned producers exists, deficiencies and problems associated with the PEP's have emerged in the following areas:

   a) Equipment is over age, obsolescent, or has been cannibalized.

   b) Priority is low for funding and staffing for industrial preparedness planning and munitions base management.

   c) Confidence in the validity of data contained in DD Form 1519's and other basic industrial preparedness planning data has been diminished.

d) The base capability has suffered attrition because of producer withdrawals or diminished capability of producers (e.g., loss of skills).

b. Munitions Base Industrial Preparedness Planning

1) Current mobilization requirements emphasize a high state of readiness and earlier response for a wide range of critical items.

2) Munitions preparedness planning is characterized by the following:

a) Fluctuations in production requirements and needed response time, depending on the current scenario(s), force levels, and estimated consumption rates.

b) Technological developments that introduce new items into the production base.

c) Planned producers leaving and/or joining the base.

d) Changes in policies and practices of the Department of Defense and Department of the Army.

3) The Government does not have accurate data concerning the total production resource requirements and capability to manufacture a given planned item in a given producer's plant; the capability of the existing base management data storage and retrieval system is inadequate. As a result, existing industrial preparedness planning for the munitions base, in many cases, cannot ensure that a responsive and committed production capacity can be achieved to meet stated requirements.

4) There is a need for improving and modernizing management of the Munitions Industrial Preparedness Planning System, in which PEP's occupy a key role. This need has been recognized by two previous Department of the Army studies (i.e., the RAMP and SCRAM studies).

b. Current Practice

1) Although local property record books show total Government-owned equipment, the Government PEP inventory

currently maintained by DIPEC includes only industrial plant equipment in its records. It specifically does not include or identify the following:

a) All items in a PEP are not included; for example, OPE and ST.

b) Specific equipment is not identified with planned items.

c) Non-PEP Government-owned equipment in a producer's plant is not included in either inventory or planned item assignment. This category averages about 40% of the total Government-owned equipment in producers' plants.

d) Producer-owned equipment that is critical to the production capability being retained in the PEP is not accounted for, nor is this equipment identified by planned item assignment.

2) The Government's capability to assess the productive capacity of each planned producer (in terms of industrial plant equipment) is hampered by the deficiencies cited in Item 1) above. Current analyses of production base capabilities, in practice, omit these important, complementary equipment resources (e.g., producer-owned equipment, tooling, and other support equipment).

3) A recent sampling of PEP equipment indicates that, in some plants, more than 40% of the industrial plant equipment is in worse condition than records indicate; on the average, only about 9% of the equipment is in better condition than indicated (see Tables VI-5, 6).

4) Adequate condition assessment data for most significant items of equipment are not available. These data for PEP equipment are being obtained for those PEP's included in this study.

5) The validity of assigned planned item production capacities for planned producers who have not been analyzed during PEP Modernization Task B-5 is suspect and probably inaccurate. Forty-six out of 118 PEP's (i.e., 39%) were considered during this study.

6) There is no working system for translating mobilization planned item requirements into industrial plant equipment needs, because modern automatic data processing techniques have not yet been adopted for this important program. This situation is also, in part, attributable to the current PEP inventory discrepancies, specifically as noted in Item 1) b), above.

7) Translation of mobilization planned item requirements into industrial plant equipment needs requires producibility data on all Government-owned equipment, both PEP and non-PEP, in terms of assignment to produce specific planned items.

8) Designators assigned by ARRCOM to PEP inventories to identify those pieces of PEP's required for each planned item would:

   a) Highlight the industrial plant equipment intended for use in production of more than one planned item.

   b) Facilitate determining plant capacities by planned item.

   c) Develop the relationship of specific pieces of industrial plant equipment to planned item requirements.

   d) Identify the impact on the producer's capability of lending PEP equipment.

   e) Facilitate management of the PEP inventory. Implementing this procedure would not require any change in authorization practices current to the office of the Assistant Secretary of Defense.

9) Current data on existing production assets and requirements are not provided continuously; periodically updating these data at the present intervals is not sufficient to provide the needed mobilization base response.

10) DD Form 1519's, as currently used, include the following deficiencies:

a) Inaccurate data: some producers and subcontractors have overplanned with respect to capacity.

b) Key data elements have not been validated by adequate production planning or manufacturing engineering analyses.

c) The latest revision of the TDP is not always provided to the producer.

d) The lack of a binding contract results in instances of "lip service" to the agreement on the part of both Government and planned producer, because it is viewed solely as an agreement to negotiate a production contract at some future date without any commitment to do so. Therefore, bona fide mobilization commitments do not exist on the part of either the Government or the producer, unless they are included in facilities or production contracts.

d. Producer Capability

1) Because a contractor can receive compensation for any reasonable and relevant purpose under a consolidated facilities contract, it appears that the facilities contractual procedure could be used to ensure a mobilization production commitment without compromising the Government's peacetime procurement options. This alternative should be explored for feasibility of implementation.

2) The level to which Government-owned assets are required to supplement those of the producer is, to a large degree, dependent on the capability of firms brought into the mobilization base.

3) Current practice is to augment producer-owned equipment with PEP's and to use facilities contracts as incentives to encourage participation in the base.

4) The ready availability of PEP's encourages producers who may not otherwise have an interest in munitions programs to participate; some of these producers have marginal inhouse resources and require up to 100% of needed planned item production equipment from Government PEP's.

5) Government bid evaluation factors (which account for the presence of PEP equipment in a producer's plant) are weighted in favor of using old equipment, which essentially penalizes equipment modernization and tends to increase the producers' dependence on PEP's.

6) Complex government procedures and paper work together with excessive requirements for interface with government inspectors and auditors tend to discourage participation in the munitions program.

7) The core-facility concept of peacetime procurement (which emphasizes stockpiling vice readiness) could lessen the dependence of industrial preparedness on inactive PEP producers.

8) Industrial preparedness planning by planned producers is not generally funded by the Government, although the military departments are authorized to do so.

9) Producers are not generally planning for the inhouse industrial preparedness implied by their mobilization commitments (DD Form 1519).

10) The Government should require adequate industrial preparedness planning by planned producers and should include expenses associated with the continuous update of technical data.

11) Forty two assigned producers were evaluated to determine capability for mobilization production, in terms of 11 significant criteria (not including management and financial capability). Results of the analysis indicated the following:

    a) None of the 42 firms met all 11 criteria.

    b) Existence of a good quality assurance program is the only criterion met by as many as 32 firms.

    c) About one third of the firms lacked adequate facility space for mobilization production, plant layout drawings, or control data for their industrial plant equipment.

d) More than half of the firms: (a) have OSHA and pollution problems; (b) lacked tooling production capability, technical data packages, laboratory facilities, and adequate mobilization planning, and; (c) were substantially dependent on military work. Based on this review of representative active producers, the capability of existing PEP producers to meet planned mobilization assignments must be validated.

12) Peacetime cooperation in industrial preparedness planning by the private sector is voluntary.

13) Recent trends indicate a withdrawal of capable firms from the munitions base--about 15 within the past 2 years.

14) The attrition of the base in terms of numbers of producers could be a favorable development if the capabilities of the remaining producers were concurrently being upgraded.

15) Private industry is the generator of advanced production technology. Therefore, to take full advantage of the ingenuity available in our national industrial base requires having qualified firms to provide a strong input of new technology and improved manufacturing systems.

16) The munitions base management task requires a modernized package of management tools and reallocation of resources.

17) An important directive concerning Army IPP is contained in paragraph 2-27e of AR 700-90, which states:

"Plans will be based on current capability. Production capability data should not reflect filling plant equipment package voids, updating deficient technical data packages, or correction of production deficiencies until such Industrial Preparedness Measures (IPM's) are consummated or until dollars are allocated in the budget year to alleviate the deficiency. Plans will, however, reflect by appropriate footnoting the full production potential

that could be realized with additional facilities, plant equipment package conversion or modification, and similar industrial base improvements."

A strict implementation of the foregoing would result in realistic IPP and fully qualified planned producers.

e. ARRCOM Capability

1) ARRCOM should have ongoing capabilities to:

a) Validate lead time and production rate data shown on the DD Form 1519 for each producer.

b) Perform functions of current ad hoc teams for Condition Assessment, Condition Determination, and Command Review of the Industrial Base.

c) Provide for interface and audit of each planned producer, including details of facilities contracts.

d) Determine validity of assumptions about each plant's financial condition, manpower, skills, raw materials, and producer-owned equipment.

e) Ascertain the continuing capability of each plant to meet mobilization production commitments and to assist in identifying and resolving relevant problems.

2) Because of the scope of ARRCOM's investment in equipment ($840 million), the importance of munitions industrial preparedness to the nation, and the complexity associated with the dynamic characteristics of munitions production planning, the capabilities outlined in Item 1) above should be an inhouse function of ARMCOM rather than be delegated to other government agencies.

f. Previous Studies

1) Recent studies by Arthur D. Little, Inc., the RAMP study, and the SCRAM study have focused attention on the importance of and the need for improvements in industrial preparedness planning.

2) KE/SAI concur, in general, with the following:

a) Portions of the RAMP and SCRAM reports that identify deficiencies in current industrial preparedness planning.

b) Comments in the RAMP report about the need for improving the preparedness program and munitions production base management by additional high-level support.

However, KE/SAI also conclude that the thrust of corrective action should be directed to well-defined tasks designed to improve the methodology and capability of the industrial preparedness planning system as enumerated in this report.

3) The KE/SAI position on peacetime acceleration planning differs from both the RAMP and SCRAM studies, as KE/SAI consider it to be only one aspect of industrial preparedness planning. Additional planning entities should be organized within the industrial preparedness function and tasked to upgrade the total industrial preparedness planning effort, including peacetime acceleration.

4) SCRAM assumptions were that PEP utilization under peacetime acceleration will be based on actual condition and location. These data currently require validation; consequently, the ARRCOM inhouse plant analysis and audit capabilities, as noted in Items e 1) and e 2), are required for proper acceleration planning. This should be integral to the total industrial preparedness planning function as noted in Paragraph 3), above.

2. Recommendations

a. Industrial Preparedness Planning

Modernization of the munitions production base and its management system in terms of correlated tasks should be planned for and implemented; the ultimate objective is to achieve the requisite confidence level in munitions industrial preparedness planning.

Modernization of the base and its management, in this context, includes modernizing, clarifying, and upgrading the following as appropriate:

1) PEP system directives and manufacturing engineering analyses.

2) ARRCOM industrial preparedness planning capability, plant audit capability, management data bank, and resource management system.

3) Planned producer capability.

b. PBM

1) A PEP Modernization and Management Manual should be developed to correlate and consolidate all policies and procedures applicable to modernization and operations of PEP's, including those assigned to GOCO's, GOGO's, and private producers.

2) A manual of instructions for layaway and startup by generic equipment types should be developed.

(See subsection III.E for recommendations concerning PEP system directives.)

3) Perform modernization analyses for the 26 inactive PEP's and 44 X-facilities not currently included in the PEP Modernization Program.

4) Perform manufacturing engineering analyses to develop production line sequence of operations with proper machinery and equipment selection to define each line for all planned items.

c. ARRCOM Industrial Management Division

1) ARRCOM should achieve a dynamic production planning and management capability for munitions production that has validity under differing scenarios, ranging from peacetime production through peacetime acceleration in a limited conflict to full mobilization. This capability should include provisions for the following:

a) An ongoing plant analysis and audit function to provide periodic interface with each planned producer, including validation of relevant data and assumptions required in munitions planning.

b) Implementation of facilities contracts, where feasible, to commit the private sector for production under either peacetime acceleration or mobilization conditions.

c) Acquisition of a needed data bank, on a priority basis, to account continuously for the many variables, evaluate the response capability of individual producers, manage the multi-hundred-million dollar inventory of Government-owned equipment, implement specified priorities, determine tradeoffs against the authorized acquisition objective, and ensure timely production of the aggregate total of all planned items.

d) Development of a resource management system that can meet the demands implicit in effective munitions base management, the high level of readiness required, and the frequent changes in planned item requirements and capabilities. See III.F for recommendations concerning the Resource Management System and III.E for recommendations concerning Resources/Requirements Analyses.

2) ARRCOM should assess and upgrade planned producer capability:

a) On a selective basis, upgrade, modernize, and reassign resources to improve the ability of IPP to satisfy authorized mobilization requirements.

b) A reasonable incentive should be provided to planned producers for:

- Planning for current and mobilization production
- Acquiring requisite equipment and capability
- Producing at 1-8-5 MSR, or as specified

- o Retaining capability for mobilization or peacetime accelerations

- o Cooperating with a periodic audit by qualified Government assigned personnel to assure that capability is being retained

c) Provide PEP inventories with a designator to identify those pieces of PEP's required for each planned item if the benefits to be derived are significantly greater than the administrative workload generated by this revised designation. An alternative course of action would be to include this designation solely in the data bank.

d) Revise practice and procedures for developing data included on DD Form 1519 to ensure greater accuracy; perform periodic audits of the DD 1519's to validate the high confidence level assigned by the industrial preparedness planning methodology to these data.

e) Implement facilities contracts with selected producers, and, if feasible, include provisions for committed mobilization or peacetime acceleration production.

B. INDUSTRIAL PLANT EQUIPMENT (IPE)

1. Conclusions

a. IPE Inventories

1) Machine tool IPE played a key role in planning munitions production before World War II mobilization. The supply of machine tools was the principal bottleneck in the munitions rearmament program.

2) Army-owned IPE currently totals about 114,000 items with an original acquisition value of approximately $1.3 billion. Assuming an inflation factor of 3.0 results in an adjusted value of $3.9 billion. Almost 90% of all Army IPE has been assigned to DARCOM. ARRCOM controls about 56,000 pieces of IPE, which represents about 55% of all the DARCOM equipment and about half of the total Army inventory.

3) This Army IPE inventory is a valuable national resource and constitutes a key element in both current production and mobilization capabilities.

4) The Army is assigned 77% of all Defense Department PEP's--202 out of a total of 262. Army PEP's have an original acquisition cost of almost $600 million, which constitutes nearly half of the value of the Army's inventory of IPE.

5) ARRCOM has 172 assigned PEP's. This is about two thirds of all the DOD PEP's, thus highlighting the key role played by the PEP concept in munitions production planning.

b. <u>PEP-Assigned vs Non-PEP Government-Owned Equipment</u>

1) Government-owned IPE associated with the PEP's reviewed in this study totals approximately 13,000 pieces, of which about 35% is in Government central storage facilities.

2) About 28% of this total is not specifically assigned to a PEP, but may be associated with a PEP producer as follows:

a) Planned for use in connection with a PEP

b) Currently in an idle status with potential for future or mobilization requirement

c) In use for current procurement

In any event, a significant amount of IPE is outside of the strictly PEP-assigned inventory. In terms of Governmentowned IPE physically located at the producer's plants, non-PEP IPE constitutes more than 40% of the total. This equipment should be held pending determination of use.

3) Assessment of producer capability by base management is hampered when firm data are lacking concerning total in-plant IPE and its assignment for mobilization production.

AD-A039 561 KAISER ENGINEERS OAKLAND CALIF F/G 15/5

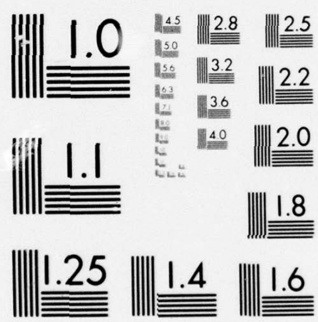
PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM. VOLUME 9. --ETC(U)

MAY 77 DAAA21-75-C-0303

UNCLASSIFIED 75-86-R-9 NL

2 OF 3

AD A039561



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

4) Determination of adequacy or redundancy of the current inventory of Government-owned IPE requires validation of both PEP-assigned and non-PEP IPE in terms of planned item assignment.

c. IPE Assignment to Producers

Small caliber ammunition producers have been assigned about 10% of the IPE associated with munitions metal parts manufacture. Producers of fuzes have about 31% of the IPE, and other metal parts producers have the remaining 59%. No small caliber ammunition PEP's are currently in X-facility status.

d. IPE Dispersion

1) PEP Government storage is at 22 sites in 15 states. Many PEP's have IPE dispersed in several locations; active PEP's are sited in up to 10 locations, inactive PEP's in up to 11 locations.

2) More efficient maintenance and management would be among the benefits resulting from consolidating PEP Government storage locations.

3) Current DIPEC practice is to store PEP's, where feasible, at a Government facility nearest to the current planned producer.

4) IPE assigned to active producers may not necessarily be in use for current production; the IPE may be in layaway on-site and/or in Government storage because current production is less than, in terms of numbers and items, those planned for mobilization.

5) The structure of a representative active PEP (PEP-227) assigned to Temco Industries of Nashville, Tennessee, is as follows:

- 57 total items of Government-owned equipment.
- 46 of these items are at the Nashville plant.
- 11 of these items are stored in Government facilities.

Thirty-two of the 57 pieces of IPE are part of the PEP; the remaining 25 (or 45% of the total) are not. The 11 pieces of the IPE in Government storage are located at seven different sites, with no more than three pieces in any one place. Four locations have only one IPE item each in storage. The current dispersion of active PEP's could delay assembling this stored equipment for emergency use and thus affect responsiveness.

e. Equipment by Type

1) Turning-and-boring equipment constitutes 35% of the total IPE; presses account for another 13%. The special machines and miscellaneous category includes all IPE not assigned to the other types and totals almost 3000 items; over half of these are stored at Government facilities. The benefits of reducing the inventory of special-purpose equipment could include savings in storage, maintenance, and management. This could justify a review to determine retention or replacement by standard equipment.

2) There should be a means of cross-referencing special machines and miscellaneous equipment back to standard equipment.

f. Equipment Condition

1) Recent Government assessment of representative inventories of PEP equipment has indicated significant instances of incorrect condition ratings, with over 40% in worse condition and approximately 9% in better condition than rated.

2) The effect of incorrect PEP condition ratings may be accented because some planned producers use more than 50% Government-owned equipment for production of munitions metal parts; several planned producers use up to 100% Government-owned IPE.

3) Status Code 1 (i.e., active IPE) does not necessarily imply that the IPE is operable.

4) The condition of producer-owned equipment, which is integral to the production capability being retained in

the PEP's, is no less important, but this equipment has not been assessed or recorded except in part under the current PEP Modernization Program.

5) Total capability of PEP's to meet mobilization assignments is indeterminate until all equipment has been assessed. This task has been initiated in the PEP Modernization Program.

6) Validations of assigned planned item capacities should be made of those planned producers who have not had PEP Modernization Analyses performed for their respective production lines.

e. Equipment Retention Modes

1) The term "hot base" should be defined explicitly in terms of production rate, to distinguish it from a "warm base."

2) A hot or warm base, by definition, has achieved startup. A cold base will generally require a minimum of 12 months for startup. However, if all required equipment and tooling are in place (at the producer's facility), connected to power, and exercised at regular intervals by a trained cadre, startup could be assumed to occur within approximately 4 months. If all equipment is in place but not under power, startup would require about 9 months.

3) A cold base has the following characteristics:

a) Planned items with significant usage requirements cannot be economically provided for by a cold base.

b) Assumes integrity of national transport to ship widely dispersed PEP's.

c) Response is substantially diminished when a planned producer has not made the item.

d) Requires layaway in at least 0-2 condition, closely adhering to preservation and environmental specifications, to ensure a level of confidence that, when

activated, the equipment can be used for the planned production.

(e) The production capability is essentially limited to the planned item configuration existing at time of layaway.

4) Inactive PEP's can be assumed to be in a cold base status for startup response; i.e., greater than 12 months.

5) X-facility PEP's require filling equipment voids to validate any assumed startup or capacity assignment.

6) Inactive PEP's and X-facilities comprise almost two-thirds of the PEP's and over one-half of the 13,000 IPE items considered in this study.

7) More than 60% of all approved PEP equipment is in layaway status. All inactive PEP's and X-facility PEP equipment are laid away, of which approximately 75% is in Government storage. The operational condition of this stored equipment is generally marginal, and its vintage extends in some cases back to World War II; the age of most of the stored equipment is over 20 years. Its usefulness for munitions production upon activation requires validation.

8) Inactive PEP's (i.e., cold base) are not currently planned to the requisite level of detail; producer interest is low, and effectiveness in terms of mobilization response requires validation.

f. Resources/Requirements Analysis

1) There is a critical need for a means of comparing planned item production requirements to the types, quantities, and conditions of IPE available in the industrial base. This comparision requires IPE data from all privately-owned equipment that is relevant to munitions production, as well as Government-owned IPE in both the private and public sectors.

2) The needed quantitative analysis should provide the essential elements of information for timely decisions

by ARRCOM on allocating IPE in response to the Production Base Plan.

3) A conceptual approach for analyzing IPE, using a matrix technique to determine the optimum practicable distribution of resources against requirements, which is found in subsection VI.E, should be further developed and tested for feasibility and suitability.

2. Recommendations

a. The feasibility of, and benefits expected from, a greater consolidation of Government storage locations should be reviewed.

b. A means of cross-referencing special machines and miscellaneous equipment with standard equipment should be developed.

c. All production lines should be under configuration management; comprehensive instructions, applicable to the following, should be in the TDP and cross-referenced in the data bank:

- o Layaway of equipment by generic types

- o Policies and procedures pertaining to modernizing and operating PEP's, including a consideration of automation and mechanization

d. A methodology should be developed that is compatible with the resource management system to enable planned item production requirements to be compared with the types, quantities, and conditions of IPE available. One approach, the matrix technique outlined in subsection VI.E, is recommended for further development and validation. This methodology should be implemented to allow determination and allocation of the optimum practical distribution of equipment resources to meet requirements.

e. All currently approved Government-owned equipment in the private sector (i.e, both PEP-assigned and non-PEP IPE) should be screened (in conjunction with performing modernization and manufacturing engineering analyses) to establish accountability and validated assignments to meet authorized

mobilization requirements. Non-PEP Government-owned equipment, if required, should be included in the revised PEP's.

f. A complete inventory and assessment of Government-owned equipment should be maintained, including X-facilities, active and inactive PEP's, related item tooling, special test equipment, and other plant equipment that is essential to production.

g. A complete inventory and assessment of producers' equipment relevant to planned item production should be maintained.

h. Army title to all planned item special tooling and test equipment should be ensured.

i. A continuous review of equipment available from the Department of Defense Industrial Equipment Reserve (DODIER) should be performed and military facility phaseout program actions reviewed to identify placements to upgrade the munitions PEP's.

j. Using the resource management system analyses, described in item 2.d, above, the following should be identified:

   1) Equipment that is redundant. The following alternative courses of action should be considered:

      a) Reassignment to other ARRCOM PEP's, including GOCO's and/or GOGO's

      b) Reassignment to DODIER with the stipulation, if appropriate, of support to projected mobilization requirements for ARRCOM IPE backup

      c) Surplusing to DIPEC for reassignment or disposal, without any stipulations

   2) Equipment that is required to supplement the existing capacity to support ARRCOM's authorized requirements. This equipment should be designated to the appropriate PEP from unassigned equipment in the DODIER, if available; otherwise, procurement actions for new equipment should be initiated.

C. SKILLS

1. Conclusions

Analysis of skills shortage considerations resulted in the following conclusions:

a. Disproportionate take-home pay for skilled persons compared to unskilled or semiskilled workers, has diminished the incentive for training to be a machinist, set-up man, or tool and die maker. This is a problem impacting not just munitions metal parts production, but our entire national economy.

b. Skills requirements and associated manpower levels vary widely from one producer or plant to another because:

- o Requirements vary with each planned item producer.
- o Each producer and plant operates differently.
- o Labor efficiency varies.
- o Requirements vary with degree of automation.
- o Requirements vary with the process.

c. Assignment of planned items to PEP's and producers, and the designation of PEP's to produce the assigned planned items, should be done so as to minimize skills shortage problems. This will require data on selected skills for many geographical labor markets around the country. Data for those individual labor markets will have to be solicited from individual state manpower agencies. BLS possesses the data on a regional basis, not by individual labor markets.

d. Both surge and full mobilization must be considered in analyzing and solving skills shortage problems.

e. It will probably be necessary to use the broad BLS skills categories such as machine tool operators, setup men, and tool and die makers instead of the more restricted categories defined in PBM's 1976 skills studies, as maximum data on skills availability in the various geographical labor markets is to be found in the broader categories. An implied penalty is that some training will be required to obtain proficiency of acquired workers in the more narrowly defined categories.

2. Recommendations

a. The skills shortage problem should be addressed on a long-term basis for IPP by using averages from long-term projections and disregarding short-term swings in skills availability due to economic cycles.

b. Analysis of possible solutions to the skills shortages problems resulted in the following recommendations.

1) Training

a) The Army should actively pursue and implement College/Industry/PEP training programs. ARRCOM should investigate the legality of adding a clause to PEP contracts wherein the producer would commit resources and support to a College/Industry/PEP training program.

b) The Government should sponsor and/or encourage skills training programs, particularly in key areas where PEP's cannot be kept active. In addition to College/Industry/PEP, these programs should include trained cadres, reserve corps, local trade schools, and apprenticeships.

c) Incentives should be offered, if necessary, to obtain candidates for the training program. Incentives could include full or partial reimbursement of tuition or expenses, pay while learning, living accommodations, and promise of employment upon graduation. The employment could be provided by participating PEP producers on commercial production requiring equivalent skills.

2) Solutions

Several of the solutions to the skills shortages problem should be used in various combinations as needed for individual producers and situations.

3) Training Coordination

ARRCOM should appoint an official with primary responsibility for coordinating all activities in the skills

area including promotion and development of College/ Industry/PEP and other skills training programs in crucial PEP areas.

4) Critical Skills

New bidders and new planned producers should be asked to: (a) state their critical skills; (b) the estimated training time or experience level and the quantity of personnel needed in each critical skill category; and; (c) their plans for obtaining the needed skilled personnel.

c. Analysis of skills shortage considerations resulted in the following recommendations.

1) Salary

The problem of disproportionate take-home pay for skilled persons compared to unskilled or semi-skilled workers, should be alleviated as follows:

a) Choose producers in labor markets where the availability problem is least severe for the needed skills. This will require an extensive survey of many local labor markets.

b) Encourage producers to automate operations requiring the disproportionately paid, hard-to-obtain skills.

c) Encourage producers to pay above-scale wages to attract the hard-to-obtain skills.

2) Impact Avoidance

a) The skills impact should be carefully considered when assigning planned items to PEP's and producers. Adequacy of skills supply should be included in the evaluation whenever planned producers are being selected or production bids are being compared, and variations in skills requirements between producers should be included in the evaluation. These should be accomplished by comparing skills spectra for requirements and supply for each producer.

b) PEP's should be designed using those processes which derive maximum benefit from the skills available to the producer involved, and avoiding skills which are in short supply in that labor market. The producer's participation in this process should be solicited and encouraged.

c) A skills clause should be added to facilities contracts, naming the critical skills and staffing levels which are required for the contractor to meet his concurrent DD1519 production rates. This clause should require the producer to submit a plan for obtaining the needed skills. The plan should be reviewed annually and the contractor should update it to reflect changing trends in skills availability or changes in his requirements. Preparation of this plan may involve compensation to the producer.

d) A brochure should be prepared, or a series of articles in "News from PBM," explaining to producers what options they have for solving their skills shortages and how to implement each option. This will permit PBM to act as a clearing house for producers' innovative solutions to skills problems. Also, it will permit producer/Government interfaces to be clarified so that the producers can act more effectively.

3) Solutions

ARRCOM should select or evaluate the solutions for each producer's skills shortages problem considering current production, surge, and full mobilization conditions separately. This should be done when initially selecting a producer, and again at each annual renewal.

D. ENGINEERING DOCUMENTATION

1. Conclusions

a. Engineering documentation for munitions metal parts production is furnished partially by the Government and partially by the PEP producers. Government furnished documentation includes technical data packages (TDP), descriptions of manufacture (DOM) and documentation for Government furnished

industrial production equipment. Producer generated documentation includes process descriptions, equipment requirements, plant and equipment layouts, tooling documentation, quality assurance documentation, production control documentation, equipment maintenance records, bills of material, subcontract documentation for raw materials and piece parts, equipment documentation, administrative documentation, and facility management and maintenance documentation.

b. Technical data packages are found to be of basically good quality, with only occasional administrative problems such as producer not having TDP, wrong document revision used, or occasional microfilm partially illegible at the edge.

c. Producers must have up-to-date TDP's for meaningful planning to be accomplished. This is required by Army regulations and directives. None of the plants visited by the KE/SAI teams receive TDP updates as prescribed. Some of the producers had no up-to-date TDP's and the other producers had only partially up-to-date TDP's.

d. KE/SAI modernization visits to plant producers indicated that producers sometimes file TDP revisions without the necessary review and study. Revised TDP's may require changes in manufacturing processes, but if the plant producer has not reviewed the revision, then the validity of the producer's IPP is in question.

e. KE/SAI teams reported only rare instances where producers had ever received a description of manufacture to assist mobilization planning or startup of the PEP lines. It is understood that the Army has not been buying DOM's for the past ten years because of the high cost.

f. Government documentation for IPE is inconsistent; sometimes a producer receives complete documentation with Government IPE but frequently the documentation is incomplete.

g. A producer's process descriptions should accompany a PEP package to layaway so that they will be immediately available when a PEP is to be activated.

h. Quality assurance documentation is found to be the most consistently satisfactory of all documentation generated at

producers' plants; recommendations for improvement are not considered to be necessary.

i. It was noted during KE/SAI plant modernization visits that equipment maintenance records were not always available and were not of consistently high quality.

j. Equipment documentation is especially important for the more complex machines, and for machines which have been irreversibly modified. Proper documentation will prevent users from being misled as to a machine's capabilities.

k. As a general conclusion, the more recently that a product has been produced, the more likely it is that the engineering documentation for that product will be available and complete.

l. A program as large and complex as the PEP modernization program presents numerous possibilities for potential cost growth and interface problems. The discipline of configuration management permits the avoidance of these possibilities. Configuration management: (a) identifies and documents the functional and physical characteristics of hardware, software or a system; (b) controls changes to those characteristics, and; (c) records and reports on the status of the changes.

m. Configuration changes should be permitted only for reasons of safety, significant advance in the state-of-the-art, significant design improvement, correction of operation deficiencies, pollution abatement, and for major cost reduction. PBM OSM 70-1, "Configuration Management Operating System Manual," dated 1 April 1976, incorporates applicable features of configuration management and adapts them specifically to the munitions production base modernization and expansion program.

2. Recommendations

a. Revisions to TDP's should be automatically and promptly forwarded to all planned producers as soon as the revisions are approved.

b. The Government should require feedback from a planned producer upon receipt of a TDP revision, for confirmation that

the producer is aware of any changes in production equipment requirements or in manufacturing conditions that affect mobilization planning. It is recommended that this be accomplished by submitting a form to the producer to be filled out within a specified time after receipt of the revised TDP and returned to the Government. This form should request that the revised technical data be reviewed for its effect on the planned producer's ability to produce the planned item in the planned quantities and within the planned response time. The form should require the producer to identify any additional equipment required, any changes to subcontracted items or services, and any anticipated problem areas. The form should also require an estimate of the producer's time and cost for updating the production line to meet the new TDP requirements. Facilities contracts should be modified to require and to fund the above actions by the planned producers.

c. It is recommended that facilities contracts be modified to require that PEP producers provide, update, and maintain documentation for PEP equipment, and place the documentation with the equipment when it leaves a producer's plant. It is further recommended that these responsibilities be covered in detail in the PEP management manual recommended in this report.

d. It is recommended that facilities contracts be modified to require that the contractor include process descriptions with a layaway package of PEP equipment so that those descriptions will be immediately available when the PEP is to be reactivated. The facilities contracts should state clearly that a process developed under a PEP contract belongs to the Government, and may not be withheld by the producer as being proprietary.

e. When equipment requirements are being documented, any special facilities requirements for the equipment should be included. These would include requirements for utilities, effluent control, environmental limitations and special supports or foundations. It is recommended that the determination of the adequacy of a plant to provide for these various facility requirements should be an integral part of IPP and should be verified by Government surveillance.

f. It is recommended that facilities contracts be modified to require that planned producers provide plant and equipment layouts. In addition to the equipment and associated work space, these layouts should also include space requirements for special foundations, auxiliary components with their separate control cabinets, inspection stations, surge bins, raw materials stockpiles, toolroom, power transformers, switchgears, compressor stations, and all other significant space requirements so that the Government may verify that there is adequate space for everything required.

g. It is recommended that the evaluation of a potential planned producer's capabilities include a review of the production control system. This is, first, to establish that the producer has a formalized system and, second, to measure the capabilities of the system against the complexity of the mobilization production assignments.

h. It is recommended that the annual review of a contractor's capabilities include an audit of the equipment maintenance records to verify that the approved maintenance program is being followed and that the equipment maintenance records are up to date, intelligible, and sufficient to disclose the maintenance actions performed, deficiencies discovered as a result of inspections, action taken toward correcting deficiencies, and cost of work performed or cost estimates for maintenance to be performed.

i. It is recommended that the Government review subcontract documentation with two objectives. First, to verify the planned contractors preparedness planning and thus readiness posture and, secondly, to verify that the planned subcontractor's capabilities will not be exceeded when supplying a number of planned producers. Where a raw materials vendor or piece part manufacturer is a supplier to only one planned contractor for munitions metal parts, then it is recommended that the supplier be a subcontractor and that all documentation be handled directly by or through the planned contractor. An exception to this would be the case of an extremely critical raw material in which case direct Government handling of the supplier and a separate facilities contract should be used even if the firm supplies a single planned producer. Where a firm is a supplier to more than one prime contractor, it is recommended that the Government handle all preparedness planning, contracting,

and related documentation directly with that firm and that the Government enter into a facilities contract directly with the supplier.

j. It is recommended that facilities contracts be modified to include a comprehensive listing of all equipment documentation that should be provided and to require a comprehensive listing with the DD Form 1342 of all equipment documentation that is actually available. It is recommended that the facilities contract be used to require that the producer acquire and maintain such records for both Government IPE and private IPE. It is recommended that producers be funded through their facilities contracts for the performance of IPP. They will then be more willing to generate the documentation needed for thorough advanced planning.

k. It is recommended that required producer documentation be prescribed in at least the following detail in the facilities contracts:

- o DD Form 1342's for receipt of equipment, changes, equipment no longer needed, and completion of disposal
- o Packing list describing basic item and all accessories and auxiliaries (DD Form 1342, augmented by KE/SAI CA forms, may be adequate)
- o Inspection and test records, reports and forms
- o Work orders and maintenance expenditures
- o Cost estimates of repair or rebuild
- o Purchase order, purchase description, receiving reports
- o Shipping instruction, shipping document, damage or shortage reports
- o Technical data:
  - Operating and installation instructions
  - Diagrams of electrical and hydraulic systems and utility connections

- Photographs, manuals, and other manufacturer's literature

- Machine parts lists

- Lubricating charts

m. Configuration management techniques should be used to prevent cost growth and interface problems during the PEP modernization program. Configuration management should be applied to PEP production systems, PEP equipment, and to the development of PEP management systems. It is recommended that PBM OSM 70-1, "Configuration Management Operating System Manual," issued by the office of the Project Manager for Munitions Production Base Modernization and Expansion, be applied to the system and be followed faithfully in order to realize maximum benefit from PEP modernization.

E. DIRECTIVES

1. Conclusions

The body of directives examined (37) does contain adequate intent, authority, and direction to achieve PEP program objectives. Their overall structure, however, as discussed in Section IX, is not such as to assure coherence, consistency, and an absence of ambiguity for the transmission of instructions to the operating echelons. This circumstance, taking into account the variation in distribution lists with command levels, induces actions or policy interpretations that are not in conformance with the intent of the governing directives.

Thus, it is concluded that the controlling directives for the PEP program, as examined, constitute a management system existing at this writing in embryo. The information resources for its development are at hand, and the preparation process would also provide an opportunity for resolution of inconsistencies among the current directives.

2. Recommendations

The Army should prepare a "PEP Manual" that includes all policies and procedures relevant to the PEP program. PEP terminology should be clearly defined therein, and the manual

should be the sole reference for all operating personnel involved with the PEP program, whether military or civilian, Government or planned producer. The manual should, in addition, resolve inconsistencies and ambiguities discerned in the body of documents studied and provide clear-cut guidance for the determination of governing authority.

This manual should be prepared by an agency fully cognizant of all pertinent directives, aware of the spirit and intent of the PEP program, and possessing full authority to perform the needed interpretive and guidance roles. The same agency should maintain a continuous review program to ensure that all changes in policy or procedure pertinent to the PEP program are reflected in revisions to the "PEP Manual."

F. RESOURCE MANAGEMENT

1. Conclusions

a. The data available to IPP management are not maintained in a timely manner; this impairs effective planning.

b. Some data considered necessary for IPP are not available to IPP management; e.g., validated producer capability information for both public and private sectors.

c. Achievement of current IPP response time requirements (of six months or less for startup) is compromised by delays inherent in the current manual data handling systems.

d. A significant amount of repetitive manual clerical work is being done to prepare production base plans and analyses; this could be done faster and more accurately by computer.

e. The needed capability of the resource management system includes the following:

   o Acquisition, storage, monitoring and retrieval of all pertinent data, including:

      - Producer capabilities and other producer related information
      - Inventory of finished goods, skills and equipment

- Equipment voids, multiple-use equipment, and equipment with undercapacities.

o Capability for analysis of all significant factors in IPP, including the impact of alternative decisions prior to their implementation.

o Automation of the planning process where practicable.

o Achievement of requisite compatibility between the data bank, the analytical tools being developed by JACP and ARRCOM, and the ARRCOM resource management system and other systems used by DARCOM's major subordinate commands (MSC's).

f. The scope of the resource management system needs to extend beyond consideration of only metal parts production in the private sector; it requires integration of all levels and functions of IPP associated with munitions, including LAP operations and interface with the corresponding weapons inventory and production base. The resource management of PEP's is but one facet of the overall resource management system.

g. Specific problem areas of IPP management are being addressed by the development of various models and systems, i.e., Item Acquisition/Production Tradeoff Model, PEPMIS, etc. An overall plan of action for system development to serve IPP management appears to be missing.

h. A systematic computerized approach for passing readiness information to the top policy levels of IPP management does not exist. Also, such an approach for monitoring the execution of plans at the production levels is not in evidence.

i. Implementation of the modernized system needs to be based on a prioritized plan of action developed in the early design stage; this plan should provide for information flow through all concerned levels of management.

2. <u>Recommendations</u>

a. The Government must commit to a more active and continuous collection of resource data related to IPP.

b. Expand the current PEPMIS (Plant Equipment Package Management Information System) to include producer-owned equipment and unassigned equipment.

c. Design the Resource Management System to cover a broader scope than that encompassed by PEPMIS. Design and implement the system with capability to manage the munitions production base, to provide the analyses required for effective IPP and to achieve compatibility with other systems used by the MSC's. In the process, integrate new and existing EDP systems and models, including PEPMIS, into a cohesive, functioning system.

d. A vertically oriented design is recommended to provide complete information flow between all levels of IPP management.

e. The use of "data bank" technology is recommended as essential for the efficient maintenance of the large body of information required to support the Resource Management System.

f. Replace repetitive, manual processes by electronic data processing wherever practicable to achieve the faster reaction times that are required for the management of IPP. Employ computerized trade-off analysis and mathematical modeling techniques to speed the decision making process.

g. Design the Resource Management System to address the entire management of IPP for the munitions production base. It should be implemented in sections in accordance with ARRCOM's priorities.

h. As primary user of the Resource Management System, ARRCOM's Industrial Management Directorate should take responsibility for the system and should have a high degree of involvement in its development and maintenance.

i. Implement design and development of the system, using the following approach:

   1) Establish a preliminary design team to determine all significant parameters and requirements, including:

      - Management objectives
      - User data requirements

- o System flow
- o System performance
- o System security and back-up
- o Data sources and acquisition
- o Computer requirements
- o Software requirements

2) Prepare a feasibility report with system recommendations, cost estimates, implementation priorities, and proposed schedules.

3) Augment the preliminary design team and develop detail system design and system specifications.

4) Initiate data collection.

5) Develop, install and test the complete Resource Management System.

6) Prepare operations, maintenance, and training manuals.

7) Train operating and maintenance personnel and verify user acceptance.

The preceding subsections A-F, inclusive, presented the conclusions and recommendations drawn from the body of the report.

The following subsection G presents an integrated plan in outline for implementing the recommendations. This plan represents the next succeeding step to the PEP Modernization Program. As shown in the preceding text, the current program has produced a substantial portion of the essential "spade-work" for the proposed tasks.

G. IMPLEMENTATION OF RECOMMENDATIONS

1. General

The foregoing recommendations have indicated a need for a systematic program of substantial scope to ensure the effective modernization of the munitions industrial base. Such a program should be an integrated continuous effort rather than intermittent, to reflect the dynamic, everchanging nature of the capabilities of the munitions industrial base and of the requirements levied upon it. Therefore, KE/SAI recommend that implementation of the program be planned and staffed on a continuing basis.

With the ultimate objective of developing a modernized munitions production base management system, a number of basic tasks have been identified which provide the organizational, procedural, and information management framework for task details addressed to particular problem areas identified in this study. A proposed approach for implementing the program was graphically illustrated in Figure III-1, "Modernization of the Munitions Production Base Management System". This figure emphasizes the scope and essential integrity of the program by recommending that the effort described in the following text be coordinated by a "Task Force". This task force will operate under the policy guidance and review control of a "Steering Committee" constituted by DARCOM, composed of representatives from DARCOM, ARRCOM, PBM, and other affected MSC's. The "Task Force" may contain members of the military service, civil service, and civilian contractors' staffs, selected on a basis of skill requirements and personnel availability, to perform the tasks effectively; implementation actions would be supplied by the indicated DARCOM agencies.

Figure III-1 depicts the tasks and task details recommended, for the following purposes:

a. Shows the organization of the cognizant groups under whom the major tasks would be implemented, in accordance with DARCOM Steering Committee guidance, as follows:

   1) Office of the Project Manager, DRCPM-PBM, PEP Division

      a) Task 1. Clarify/Integrate Directives.
      b) Task 2. Perform Modernization Analyses.

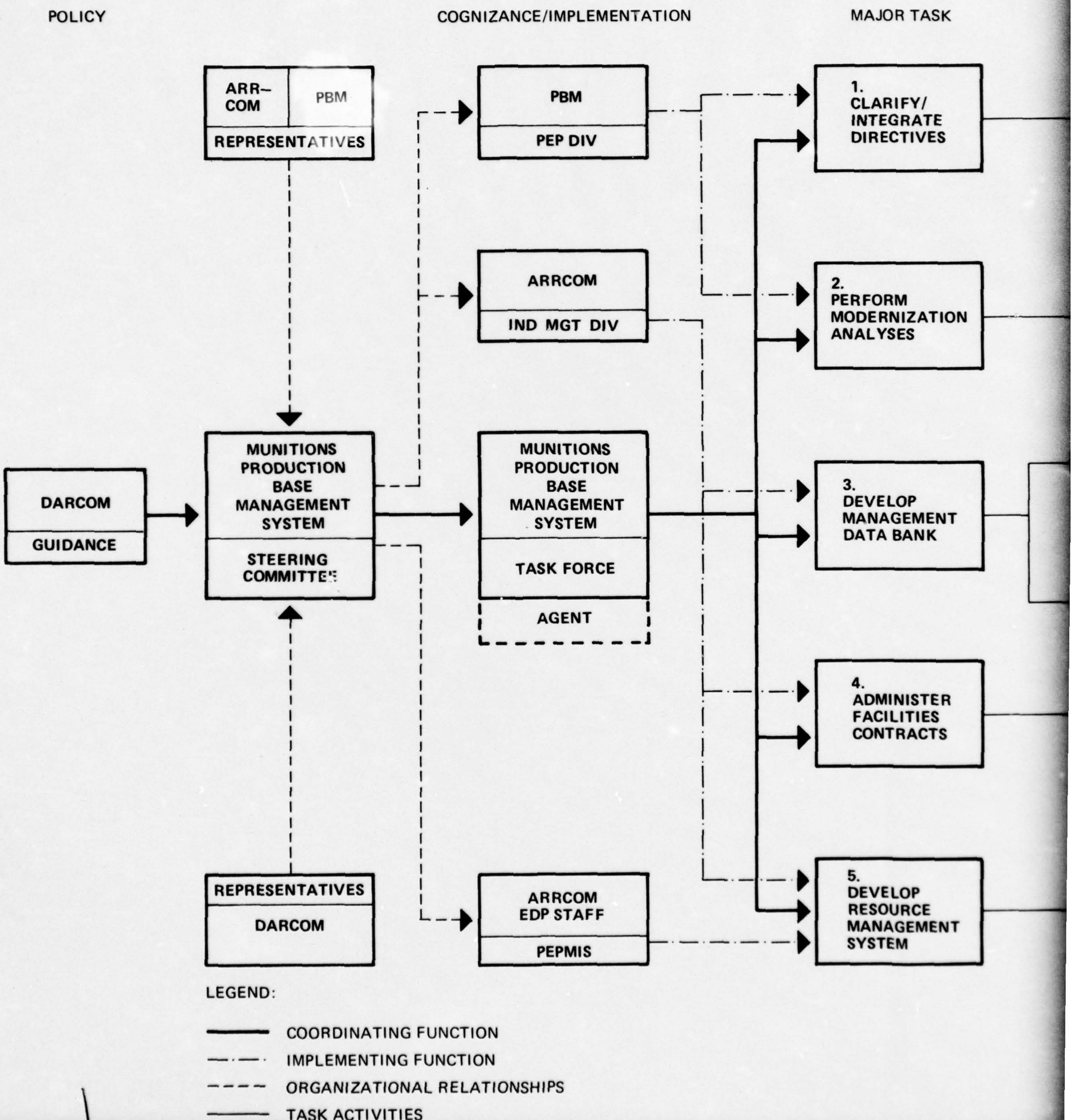
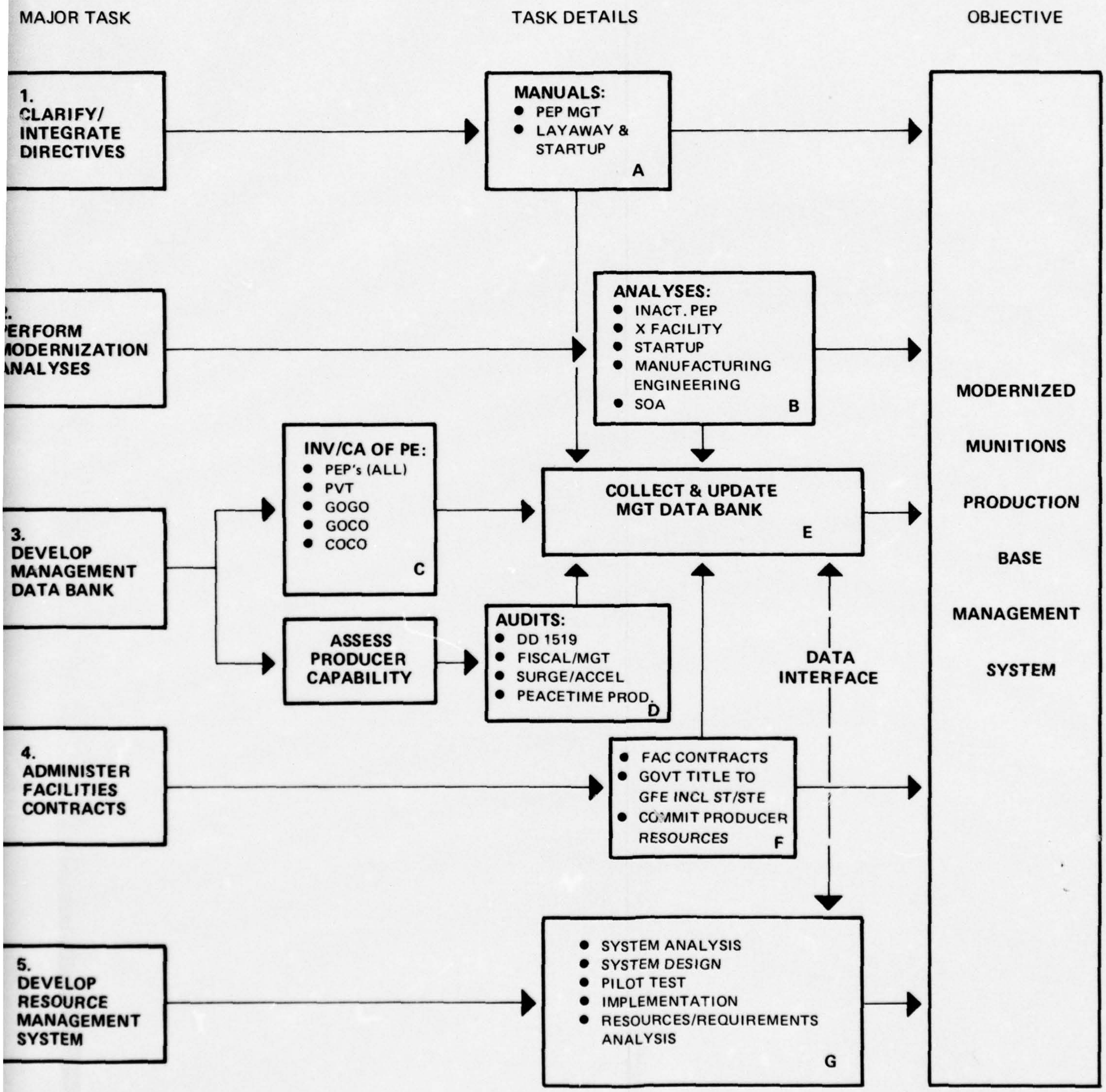

POLICY
COGNIZANCE/IMPLEMENTATION
MAJOR TASK
ARR-COM
PBM
REPRESENTATIVES
PBM
PEP DIV
1. CLARIFY/ INTEGRATE DIRECTIVES
ARRCOM
IND MGT DIV
2. PERFORM MODERNIZATION ANALYSES
DARCOM
GUIDANCE
MUNITIONS PRODUCTION BASE MANAGEMENT SYSTEM
STEERING COMMITTEE
MUNITIONS PRODUCTION BASE MANAGEMENT SYSTEM
TASK FORCE
AGENT
3. DEVELOP MANAGEMENT DATA BANK
4. ADMINISTER FACILITIES CONTRACTS
REPRESENTATIVES
DARCOM
ARRCOM EDP STAFF
PEPMIS
5. DEVELOP RESOURCE MANAGEMENT SYSTEM
LEGEND:
COORDINATING FUNCTION
IMPLEMENTING FUNCTION
ORGANIZATIONAL RELATIONSHIPS
TASK ACTIVITIES

FIGURE III-1

MODERNIZATION OF THE MUNITIONS PRODUCTION BASE MANAGEMENT SYSTEM



2) ARRCOM Industrial Management Division

a) Task 3. Develop Management Data Bank.
b) Task 4. Administer Facilities Contracts.

c) Task 5. Develop Resource Management System, jointly with ARRCOM Electronic Data Processing Staff.

b. Identifies the detailed tasks associated with major tasks.

c. Illustrates the interdependence of the detailed tasks.

d. Highlights accounting for both the Government sector (PEP/GOGO/GOCO's) and all of the private sector, including COCO's, in developing the data bank.

e. Illustrates the role of each task in achieving the objective of: "A Modernized Munitions Production Base Management System."

The rationale upon which Figure III-1 was constructed is outlined in the preceding subsections A to F. These conclusions and recommendations have been derived from findings described in the body of this report.

Figure III-1 indicates assistance to the "Task Force" by an "Agent" (shown in phantom), as designated by the cognizant authority. This assistance may be in-house expertise or contracted services, depending on the skill requirements and the personnel available.

The following paragraphs outline the recommended approach, described in terms of the major tasks. These tasks have been conceived to achieve a modernized munitions production base system, as depicted in Figure III-1, within the currently assigned cognizant Army agency. The key word for these tasks is "integration". A major finding in this report is that the elements for developing a management system exist, but are distributed in a fragmentary fashion among numerous documents and various agencies; as a result, the need for a single, integrated system has been manifested.

2. Task 1. Clarify/Integrate Directives

The studies undertaken, and the experience gained, in the course of the PEP Modernization Program led to the general conclusion that integrated procedural documents would be of substantial value and aid in modernizing the munitions production base management system. The information developed for the current program will provide much of the technical groundwork for the manuals described in the following text.

a. PEP Management Manual Development (Refer to Figure III-1, Block A)

As review of the body of directives pertinent to PEP management was performed as reported in Section IX. The findings of this study, and the conclusions drawn therefrom, indicated the need to undertake the following described subtask. All pertinent authorizing and implementing directives relative to the modernization and operation of PEP's will be clarified and integrated into a PEP Management Manual to provide a consolidated source of information for all policies and procedures pertinent to PEP's. Data from relevant documents identified during development of the manual and ARRCOM guidance and comments will also be included in the manual.

The approach to developing the PEP management manual should include the following:

1) Review of present PEP organizational structure, identifying major cognizant commands and agencies.

2) Development of an information/action flow diagram, identifying organizational elements responsible for PEP management. Where relevant, delineate alternative actions.

3) Summaries or extracts of sections of directives that are directly related to the actions of various organizational elements. Where conflicts are discerned, alternatives should be evaluated and recommendations for revisions developed.

4) Determination of unique, major action areas within the overall system. A standard operating procedure (SOP) should be developed for each unique area.

Results that can be expected from development of the PEP management manual are as follows:

(1) The integrated manual would contain sufficient information to ensure that organizational elements can effectively perform their assigned missions. Referencing pertinent documents is as described in Paragraph 3) of the approach description. ("Incorporation by reference" was identified in Section IX as contributing to present PEP management problems).

(2) An opportunity is presented for evaluating and restructuring the entire PEP management system, if determined to be necessary by the cognizant authority. The recommended manual would be a complete overview of the total PEP system, in which all levels of command would be provided with insights into organization and operations.

(3) The manual, in working draft, would provide a conceptual framework for developing and correlating all tasks recommended herein.

b. Layaway and Startup Manual Development (Refer to Figure III-1, Block A)

The Layaway Plan developed in PEP Modernization Program Task B-4 and Task F's Automation and Mechanization Study provide the conceptual and technical guidelines for preparation of this procedural document. Plans per se are broad in their expression, to preclude unnecessarily rigorous restrictions on their executors. However, the consistent performance of a body of tasks of a repetitive nature is in large degree assured only by a formally defined approach. This treatment, responsibly performed, follows detailed, step-by-step, instructions with deviations permitted only in the recognition of explicitly defined criteria. The development of the recommended layaway/startup manual would be directed to this intent. DOD Directives, regulations, and manuals pertaining to layaway and/or startup, including preservative specifications, should be clarified and integrated into a

layaway/startup manual designed to provide a uniform and consistent procedure for placing Government-owned equipment into an inactive status or returning it to active use. The manual should be applicable to all equipment types, including OPE, ST, and STE, and it should provide for layaway of any single PEP at a single location. The manual should also provide for any needed repair or rehabilitation of industrial plant equipment before it is laid away.

The layaway/startup manual will include information from generic type equipment specifications using approved procedures for equipment condition assessments and determinations, equipment repair and rehabilitation, and disposal and replacement of nonrepairable equipment. The manual will be prepared under the guidance of ARRCOM, using DOD standards and specifications pertaining to the preparation of technical manuals.

Several steps are integral to producing a layaway/startup manual, as follows:

1) Develop an operational sequence diagram (OSD) of overall layaway and startup procedures; identify alternative actions and specify general criteria for selection.

2) Develop a general outline.

3) Compare and cross-reference the operational sequence diagram with the general outline.

4) Determine the need for appendices for equipment-peculiar data, using the generic type equipment specifications.

5) Prepare a working draft, ensuring that relevant documents are abstracted and incorporated. Where conflicts are identified, evaluate alternatives and recommend resolutions.

6) Following review and approval of the working draft, prepare the final draft.

It is suggested that this manual be validated by actual layaway and startup activities.

The results expected from developing a layaway/startup manual include the following:

(1) The manual will supplement industrial preparedness planning. With the passage of time, it will reinforce and enhance the effectiveness of "GFE Inventory/Condition Assessment," discussed in Paragraph 4.a.

(2) Conformity in practice to the manual will ensure a ready reserve of equipment in serviceable condition for mobilization or acceleration replacement requirements.

3. Task 2. Perform Modernization Analyses (Refer to Figure III-1, Block B)

a. Inactive PEP and X Facility Production Base Management

Documented procedures and criteria developed as technical approaches for Tasks B-1, B-5, B-6, and B-7 of the PEP Modernization Program, under Contract DAAA21-75-C-0303, will be used as a base for extending modernization studies to all currently designated PEP's, including all PEP's not presently contracted for study: that is, 26 inactive PEP's and 44 X-facilities.

Results expected from this analysis include the following:

(1) A comprehensive evaluation of the total PEP inventory which, when entered into the Resource Management System, will provide essential data for industrial preparedness planning.

(2) Data inputs will be provided to the inventory and condition assessment of Government-owned equipment, discussed as a separate task (see Paragraph 4.a.), and the manufacturing engineering analysis, also discussed as a separate task (see Paragraph 3.c.).

b. Automation Study

An automation study will determine the impact of production automation and mechanization on startup time for all planned item production lines for either acceleration or mobilization. This study will further develop and refine the work currently in progress; such analyses are expected

to be iterative, in the light of continuing technological evolution in the machine tool industry. The technical data package (TDP) and the description of manufacture for each planned item, PEP and planned producer equipment inventories, other plant equipment lists, and the DD form 1519 for each planned item will be analyzed during the study.

The various discrete steps to be performed are as follows:

1) Define administrative, technical, and managerial requirements for startup of baseline, nonautomated production line(s). Perform analyses to determine associated lead times for startup actions and estimate the related costs.

2) Specify varying levels of mechanization and automation for the production line(s). Determine the following:

   a) Changes in requirements for technical, administrative, and managerial actions. Repeat analysis outlined in 1, above.

   b) Variations in production personnel staffing, with implied changes in skill levels.

   c) Implied costs to maintain the line(s), as differing from the baseline.

   d) Lead time (if any) for upgrading existing industrial plant equipment and implied costs.

3) Perform comparative cost/benefit analyses for the various options and the baseline. Establish (if extant) the optimum level for mechanization and automation.

The results that can be expected from such an analysis include the following:

(1) Support to industrial preparedness planning.

(2) Feasibility and cost criteria for modernizing planned item production lines.

c. Manufacturing Engineering Analysis

The purpose of this analysis is to develop a production line for each planned munitions item assigned to GOGO/GOCO plants and the private sector, define the sequence of operations, and select production machinery and other plant equipment for the line. This includes planned items currently assigned to X-facilities and to producers not needing Government-owned equipment. These analyses will not define "model lines." As noted in the preceding subtask discussion, effective procedures were developed in Tasks B-2 and B-5 of the PEP Modernization Program for the analysis of active PEP producers. In addition to the recommended extension, the procedures will be further refined to reflect unique local conditions and resources in order to identify needs for meeting production quantity requirements at mobilization.

For each planned item, the technical data package and description of manufacture will be audited for completeness and accuracy. A list of planned items and the assigned producers, and outputs from tasks described in Paragraphs 3.1., 3.b., 4.a., and 4.b., will be utilized, in addition to the TDP and description of manufacture, to develop an operational sequence diagram for each planned item. Quantity rates, holding times (i.e., off-line for inspection and test), storage and handling requirements will be specified, and manning requirements estimated with respect to skill levels. A preliminary determination of generic types and quantities of equipment will be made, including OPE, ST, and STE, which will be compared with available equipment inventories for the planned producer. The privately-owned inventories will be included as well as Government-owned equipment.

Feasibility of mobilization production will be established by the following:

1) Equipment compatibility, per inventories (with respect to the operational sequence diagram discussed above)

2) Organization and production line layout, consistent with good industrial practice

3) Equipment condition as determined in assessment tasks; identification of replacement resources

4) Analysis of the leadtime to pilot lot and production status

5) Analysis of time and cost to replace/repair/rehabilitate equipment

6) Evaluation of local resources for engineering and technical staffing requirements

7) Cost analyses for startup and production

The results of this entire analysis will be reviewed with the planned producer. The expected results of the analysis are as follows:

(1) A substantial enhancement of industrial preparedness planning.

(2) A valid base of data for determining retention of Government-owned equipment, by virtue of comparing equipment required to existing inventories.

(3) Improved cost visibility for planning purposes.

(4) Significant inputs to the Management Data Bank.

4. <u>Task 3. Develop Management Data Bank</u>

a. <u>Government-Owned Equipment Inventory/Condition Assessment (Refer to Figure III-1, Block C)</u>

All active and inactive PEP's, X-facilities, special tooling, special test equipment, other plant equipment, and GOCO's and GOGO's if not otherwise covered, will be inventoried and evaluated using the methods described in the PEP Modernization Analysis discussed in Paragraph 3.a., and other inventoried Government-owned equipment not examined during the PEP Modernization Analysis.

Criteria for the equipment condition assessment will be developed and reviewed, and the completeness of the inventory ascertained by sampling inspections. Using these data, a condition assessment of Government-owned equipment will be performed, as it relates to active PEP's, inactive PEP's, X-facilities, GOGO/GOCO plants, and the general reserve.

The results of this assessment will be utilized in the manufacturing engineering analysis discussed in Paragraph 3.c. and will provide input data to the Management Data Bank (Figure III-1, Block E). In addition, this completes the evaluation of industrial plant equipment owned by the Government, which will enhance industrial preparedness planning and provide basic data for the task discussed below in Paragraph 4.b.

b. Planned Producers Inventory/Condition Assessment (Refer to Figure III-1, Block C)

All equipment privately owned by each producer selected for planned item production, whether the equipment is supplemented by PEP's or not, will be identified and its condition assessed to provide data ensuring the accuracy and adequacy of industrial preparedness planning. All equipment voids, relative to the task discussed in Paragraph 6.b., will also be identified.

An assessment agent team, agency, or contractor will be designated by ARRCOM, and the separate and joint responsibilities of ARRCOM, the planned producer, and the assessment agent will be agreed upon.

The procedures and criteria discussed in Paragraph 4.a. and products of the manufacturing engineering analysis (Paragraph 3.c.) will be used to perform an inventory and a condition assessment of all producer-owned equipment. The resulting data will be integrated with the PEP-related and other Government-owned equipment data and used in a complete and comprehensive analysis of the condition of the planned item production line. Voids in the producer's inventory will be ascertained, and the data file of Government-owned equipment will be searched to determine the feasibility of supplementing the inventory from X-facilities or the general reserve. A cost trade off analysis will be performed to assist management in making repair/rehabilitate/replace decisions. Pertinent findings and recommendations will then be presented to the producer for review and comment. After securing the producer's concurrence, findings and recommendations will be presented to ARRCOM, including a comprehensive plan for upgrading PEP's, other Government-owned equipment, and the producer's inventory to meet

planned item capability requirements. The results expected from this assessment include the following:

(1) Complete condition assessment(s) of planned item production line(s) is provided. As such the accuracy and timeliness of data for industrial preparedness planning is ensured.

(2) By virtue of using an ARRCOM-designated agent and uniform procedures and criteria, evaluation consistency is ensured for all planned producers. This eliminates the producer capability variations discussed in Subsection V.C.

(3) Long-range planning and action for upgrading planned item production lines can be performed in a realistic context.

(4) The assignment of planned items to particular producers is validated.

c. Producer Capability Audits (Refer to Figure III-1, Block D)

Audits will be performed to provide assurance that planned producers are capable of responding to the requirements levied by the Production Base Plan. The audit team recommended in Paragraph 4.b., above, will ensure the adequacy and accuracy of the DD Form 1519 or other instrument executed for the planned item, the producer's engineering management and fiscal resources, and the responsiveness of the producer to surge or acceleration requirements.

Criteria pertinent to each planned item will be developed for the audit. These criteria should be (to the extent practicable) uniform for all planned items, reflecting only item-peculiar variations and quantity rates contemplated for the planned producer. An objective evaluation of data provided on the DD 1519 will be performed, with particular note being made of equipment condition or voids and production rates of the equipment types identified. If practicable, the team will verify that equipment voids will be filled by Government-owned equipment within the producer's allotted startup time, and will ensure that planned production quantities are consistent with equipment capabilities.

The team will also review producers' engineering management capability, to assess the following with respect to mobilization schedules or surge/acceleration demands:

1) Existence and adequacy of mobilization planning. Particular attention should be given to layout design, and to facilities accommodation of material handling and storage in addition to production.

2) Adequacy of planning and production management skills, whether on staff or available from local professional resources.

3) Adequacy of production skills, both currently employed and available in the local labor pool. Training plans for expansion of staff during startup.

4) Current status of compliance to OSHA and pollution regulations. Plans for retrieval in the event of inadequacy.

5) Planning for maintenance of industrial plant equipment. If relevant, contingency planning for long-term downtime of equipment.

6) Planning for procurement and maintenance of special tools and test equipment.

7) Quality assurance program planning, including provisions for necessary inspection, test and laboratory facilities and equipment.

8) Effectiveness of documentation control, currency of technical data package and the description of manufacture, and configuration management.

9) Organization and planning of subcontracting.

The producer's previous production history, if relevant, will be reviewed to ascertain compliance to production schedules, quantity of product, turnover of personnel, and fiscal stability. The results of this audit will provide a systematic and uniform approach to evaluating a planned producer which will provide accurate and timely data to validate the Resources/Requirements Analysis (see Paragraph

6.b.) and ensure the currency of industrial preparedness planning. It also provides a basis for decisions leading to a selective upgrading of the industrial base.

d. Data Collection and Updating (Refer to Figure III-1, Block E)

A controlled, centralized, focus for all data developed in the munitions production base management system will be provided for controlling input data format, assessing input data accuracy, evaluating input data currency, updating and/or purging the data bank, and providing resource information to users in the types, detail, and format desired.

The size and format of the files, consistent with Resource Management System design criteria, will be determined, using inputs from the following tasks:

(1) PEP Management Manual (Paragraph 2.a.)

(2) Modernization Analyses results (Paragraph 3)

(3) Inventories/Condition Assessments (Paragraph 4.a.b.)

(4) Producer Capability Audits (Paragraph 4.c.)

(5) Status of IPE under Facilities Contracts (Paragraph 5.a.)

(6) ST/STE held by Government (Paragraph 5.b.)

(7) Criteria for input/output processing from Resource Management System design (Paragraph 6.a.)

The format of input data will be determined and specified to the various data sources. A means for correlating input data from the various sources will be designed jointly with the Resource Management System agents. Criteria for determining completeness and accuracy will be developed and a method of identifying and "flagging" anomalies defined. Particular attention should be given to required data items missing from multiple inputs.

If practical, redundant data items will be eliminated from the file, although the retrieval capability for readout of original input will be retained.

A policy for updating data, including means for timely advice of the updating requirement to the cognizant activity, will be recommended, and a historical file designed to provide for a dynamic data record pertinent to industrial plant equipment, planned items, producers, contracting, etc. The expected results include a centralized, controlled data bank to provide the munitions production base management system with timely and accurate information, and a dynamic historical record of the munitions production base that, with time and the accumulation of data, will provide practical assistance to industrial preparedness planning.

5. Task 4. Administer Facilities Contracts

a. Facilities Contracts (Refer to Figure III-1, Block F)

An improved commitment for production by the private sector needs to be encouraged for selected planned producers under either peacetime acceleration or mobilization conditions. Inputs from the PEP Management Manual (Paragraph 2.a.) and the Armed Services Procurement Regulations, as applicable, will be used to determine criteria for invoking facilities-use or consolidated facilities contracts and, if practical, to provide for compensated mobilization planning.

The expected result is the capability to retain capable planned producers in the munitions production base, with a commitment by the planned producers to achieve and maintain the capability for peacetime acceleration and/or mobilization production as designated by the Government.

b. Government Title to Special Tooling and Special Test Equipment (Refer to Figure III-1, Block F)

The purpose of this task is to secure administrative control of ancillary production equipment that is not presently in the Government inventory, to ensure that planned item production lines are completely equipped at startup. This control extends to special tooling and special test equipment

to the extent determined by manufacturing analyses and policy.

Data from the PEP Management Manual (Paragraph 2.a.), the Manufacturing Engineering Analysis (Paragraph 3.c.), and Armed Services Procurement Regulations, as applicable, will be used to identify candidate special tooling and special test equipment, using the criterion of uniqueness to planned item production, acquisition cost, and procurement lead time. Special tooling and special test equipment will be selected and recommended for retention, with provisions identified for maintenance in either a hot base or in a warm or cold base, including controlled storage. The procurement process for special tooling/special test equipment approved for retention will then be executed and, if it is in a hot base, maintenance provisions will be incorporated in the production contract. If in a warm base, maintenance provisions will be incorporated in the facilities contract (see Paragraph 5.a., above), where applicable.

This task will ensure that the planned item production line(s) will be complete at startup.

6. Task 5. Develop Resource Management System

a. Basic System (Refer to Figure III-1, Block G)

All pertinent information in the planned item production system will be received, stored, processed, and selectively displayed to provide ARRCOM with a resource management system to meet the demands implicit in effective munitions production base management. All active or inactive PEP's, X-facilities, and the private sector are included, and data from the Department of Defense Industrial Equipment Reserve or other sources that are relevant may be incorporated. Input to the resource management system will include objective technical and fiscal data, including data on all designated equipment that is incorporated or to be included in the munitions planned item production base.

1) The first step is to define system requirements to be responsive to the PEP Management Manual's information flow diagrams (see Paragraph 2.b.). Data volumes, rates, sources, storage, need for real-time processing

and outputs will be determined. After the system requirements have been reviewed and approved, the Part I Specification (Design) for the system will be prepared.

2) After approval of the Part I Specification, use of existing hardware resources will be optimized, to the extent practicable, for the system design. An intensive review and evaluation of existing software will ascertain the feasibility of adaptation. Flow diagrams for data processing will then be developed, and the scope of the software to be developed or adopted will be analyzed. The hardware required to effect system integration will be identified and evaluated, with the need for, and the scope of, training for using personnel determined. A pilot system will be selected and recommended for feasibility testing, and a Part II Specification (Production) for a pilot installation will be prepared after the detailed design is reviewed and approved.

3) Following approval of the Part II Specification for a pilot installation, the pilot system will be developed, installed, and tested, observing all pertinent QA provisions. After completion of the testing and a review of the results, revisions to the Part I Specification, as required, will be made and the Part II Specification will be prepared to bring the system on-line.

4) In addition to the Part I and Part II Specifications, the following documents should be prepared:

   a) Version description document for software.

   b) Programmer's and operator's manual for software, including complete listings.

   c) System installation, operation, and maintenance manual for hardware. This may be a single or several volumes. If vendors' manuals for unique equipment are inadequate, steps should be taken (including maintenance analysis) to upgrade their utility, preferably reflecting the provisions of MIL-M-24100A.

5) A complete resource management system will then be developed, installed, and tested. In contrast to Step 3),

above, this step should be accompanied by plans and procedures that provide for detailed and intensive testing of the total system to ensure the effective integration of hardware and software. In addition, if not previously accomplished, the system manuals should be validated, and training of operating and maintenance personnel completed before the system is turned over to the user(s).

The results to be expected from the resource management system are the following:

(1) Provisions for continuous updating to reflect the constant changes that characterize munitions base requirements and capabilities, and ensuring retrievability of data needed for management decisions.

(2) Enhancement of the validity of munitions industrial preparedness planning by a computer-based system designed to project significant data, such as basic materials lead-time requirements, and to provide a means for replanning items; e.g., to better fit available skills.

(3) A significant and substantially error-free implementation of the PEP Management Manual (by virtue of EDP). By providing access to needed data without the present delays (caused by manual processing needs), mission effectiveness for ARRCOM and its agencies would be significantly improved. In addition, the release of personnel from manual data handling duties would provide an enhancement of staff capabilities.

b. Resources/Requirements Analysis (Refer to Figure III-1, Block G)

Essential elements of information are needed to make timely decisions for allocating industrial plant equipment in response to the Production Base Plan, or changes therein. This analysis extends the basic Resource Management System (see Paragraph 6.a., above) by utilizing the maximum available information on industrial plant equipment, wherever situated. All sources of data, whether Government or private contractor, will be considered. Data sources for the analysis include those considered in Paragraph 6.a. and, in addition:

IV. DEFINITION OF PRODUCTION RESOURCES

A. GENERAL

A formalized methodology encompassing five major elements is required to achieve adequate industrial preparedness planning. These five elements are as follows:

(1) A realistic determination of mobilization production and response requirements in terms of selected planned items.

(2) Implementation of funding, policy, procedures, and practice applied to plant equipment packages, producers' facilities, and defense contractor incentives that provide a base comprising competent, stable producers and modernized equipment and facilities.

(3) A valid assessment of each mobilization base producer's capability to mobilize and support the national defense effort.

(4) A data bank relating to all significant production resources and production requirements.

(5) A resource management system to enable day-to-day changes in requirements, capabilities, parameters, and assumptions to be readily accounted for by a limited peacetime staff of industrial preparedness planning specialists.

The first element, realistic determination of requirements, is a function of Army planners and is not addressed by this study; however, as stated in AR 700-90, Section 2, it constitutes the foundation of industrial preparedness planning. Items 2 through 5 are addressed in this and other sections of this report as applicable to the subject under discussion.

Items 3, 4, and 5 are discussed in this section in terms of defining production resources to facilitate realistic production planning, optimum base modernization priorities assignments, and effective resource management. Subsection B describes current Army concepts and policies that define plant equipment packages (PEP's) in the private sector. Subsection C identifies other resources (in addition to PEP's) that are needed for a complete definition of mobilization production and response capability. An integrated

resource management system is proposed to: (a) facilitate analysis of individual producer capabilities; (b) define total mobilization capabilities in terms of specific planned items, and; (c) facilitate replanning of items to better fit skills and other specialized requirements to the available resources.

A refinement in PEP equipment nomenclature is recommended as part of this proposed system to correlate each piece of PEP equipment with a specific planned item.

B. CURRENT PEP CONCEPT

The following paragraphs outline significant features of the Army's current practice in furnishing Government-owned plant equipment packages to private producers.

1. Purpose and Scope

As quoted in Section IA from Public Law 93-155 as amended 16 November 1973, cited as the Defense Industrial Reserve Act, the purpose of PEP's is the following:

"o to maintain a high state of readiness for production of critical items of defense materiel,

o to provide production capacity not available in private industry for defense materiel, or

o to assist private industry in times of national disaster."

Public Law 93-155, as amended, further states that "machine tools and other industrial manufacturing equipment may be held in plant equipment packages...." The term "industrial manufacturing equipment" is applicable to a wide spectrum of equipment. However, it is restricted to manufacturing equipment and does not include nonseverable equipment. Furthermore, PEP's are required to be identified to "particular defense materiel or defense materiel or defense supporting items at a specific level of output...." (emphasis added).

2. Inventory Methods

PEP equipment may be inventoried by one or more of the following, separate listings:

- DIPEC Printout This inventory lists only Government-owned industrial plant equipment; it is listed by PEC Number which categorizes both PEP and non-PEP by producer. The inventory does not identify industrial plant equipment in terms of production line or planned item.

- Producer Contract Involving GFE for Current Production This does not inventory producer-owned equipment. It lists only Government-furnished equipment; GFE may or may not be PEP, and it includes other than industrial plant equipment.

- ARRCOM Manual Listing of GFE when PEP (or partial PEP) is Laid Away This inventory includes detailed listings of industrial plant equipment, special tooling, special test equipment, and other plant equipment as a backup to develop data for Form P-17 to obtain funding and layaway projects. Data are normally retained only until equipment is laid away; only that portion of the PEP to be laid away is included.

Administration of PEP's by DOD is hampered because DIPEC inventory records include only Government-owned industrial plant equipment (IPE) having an original acquisition cost in excess of $1,000. They do not include IPE acquired for less than $1,000 original cost, special tooling (ST), special test equipment (STE), nor items of other plant equipment (OPE). Material handling equipment is included in the OPE category, and it can be a significant as well as a critical factor in the total production line. Some test equipment comprises complex tooling that takes months to obtain Government approval for design and manufacture. Even production and inspection gauges can become the pacing items of a production line and may shut the line down if not available when needed.

ARRCOM practice is to assign all PEP equipment in a planned producer's plant by a single PEP number. A given producer may be committed to mobilization production of several items, and all of the assigned PEP equipment may or may not be used in each of the different planned item production lines. However, the ARRCOM equipment records do not identify PEP equipment by assignment to produce a specific planned item. This distinction is important, because planning for industrial preparedness is accomplished in terms of discrete planned items; yet, the inventory system of PEP equipment is not so oriented. To

eliminate any problems, a suffix could be added to the PEP number to identify each planned item and still retain the assigned PEP designation.

Another problem occurs when Government-owned equipment may be required for producing a planned item, even though this equipment is not assigned to a PEP but is used by a planned producer for current production; here again, it is not identified by planned item. Since approximately 28% of all PEP-associated industrial plant equipment is not assigned to a PEP but still may be required for a planned item, this category represents a substantial inventory. The Government does not maintain an inventory of producer-owned equipment that is supplemented by PEP equipment in the producer's plant.

The Government's capability in assessing the productive capability of each planned producer is hampered by these deficiencies in PEP inventory practices:

- Records include only industrial plant equipment.
- Specific equipment is not identified as to planned item(s).
- Non-PEP Government-furnished equipment is not included in inventory or planned item assignment.
- Producer-owned equipment integral to the production capability being retained in a PEP is not inventoried, neither is it identified by planned item assignment.

3. Storage Locations

Industrial plant equipment from one PEP may be stored in several locations and modes, as follows:

(1) Producer line:

- Producing
- Stored in place

(2) Producer storage:

- On site (in place)
- Adjacent (off-line, but on or near the site)

o Off-site

(3) Government storage

(4) Any combination of the above

Active PEP's may have industrial plant equipment in up to four different storage modes or numerous locations simultaneously. This situation can result because: (a) the PEP is assigned to more than one planned item; (b) current production requirements are less than the PEP was planned for, or; (c) new techniques have eliminated a formerly planned process and its respective equipment.

4. Authorization of PEP's

PEP's are authorized by the Assistant Secretary of Defense (Installation and Logistics), upon request from ARRCOM. To justify the establishment or the continued maintenance of PEP's, the following conditions must be met as cited in DOD Instruction 4215.1:

"(a) They provide production capacity to meet critical mobilization needs of the sponsoring Military Departments derived through the use of, and in consonance with current Secretary of Defense Planning Guidance in accordance with DOD Instruction 7045.7, 'Planning, Programming and Budgeting System.'

"(b) Determination has been made that adequate sources will not be available to produce the required military items based on studies of time-phased mobilization capacities of both military industrial facilities and private industry.

"(c) The need for such capacity has been established in accordance with the policies set forth in DOD Directive 4005.1, Subject: Industrial Preparedness Planning."

Industrial plant equipment is authorized in terms of numbers of items and dollar value; OPE, ST, and STE are authorized in terms of total dollar value only.

The office of ASD(I&L) retains under its direct jurisdiction all authority for initial PEP authorization and subsequent review action, without the usual routine delegation of these matters to individual services. Although this practice reflects the political sensitivity of policy relating to Government-owned PEP's for private sector use, it appears to require that an unwarranted volume of detailed technical data be reviewed and maintained at the highest DOD level. It is recommended that this authority be considered for delegation under clear policy guidelines to the major subordinate command level.

5. Control of PEP's

PEP's are managed by the military organization that initiates the procurement action, either current or mobilization.

ARRCOM exercises control of PEP equipment for munitions components; authorizes this equipment to be loaned between users for temporary assignment to producers of current or mobilization contracts; and directs performance of producers of munitions planned items through cognizant DCAS offices.

As described in Section X, ARRCOM's record system for controlling industrial plant equipment in PEP's is largely manual.

C. PLANNED ITEM PRODUCTION SYSTEM

1. Rationale

Mobilization planning requires a productive capability to match an ever-changing spectrum of planned item requirements. Factors that can cause changes to planned item requirements include the following:

- Changes in scenarios
- Modifications of force level
- Formulation of new consumption rates
- Development of new items
- Initiation of policy changes by DOD or DA

Productive capability is the aggregate of a variable mix of producer capabilities. The capabilities of each producer need to be identified, quantified, and updated as changes occur in order to keep the mobilization plan on a current basis. The resources

available to any given producer, expressed in terms of facilities, equipment, and manpower, provide the basis for quantifying his capability. Because this capability must be expressed in terms of planned items, it is important that the assigned resources be similarly identified with producing specific items.

As noted in Subsection B, current PEP nomenclature does not provide this identification, because PEP's are assigned by a given producer's plant, which may be planned for many items.

It is recommended that suffix (or other type) designators be assigned by ARRCOM to PEP equipment inventories to identify those pieces of PEP equipment that are required for each planned item. This procedure would:

- o Highlight that industrial plant equipment intended to be used for production of more than one planned item.
- o Facilitate determination of plant capacities by planned item.
- o Develop relationship of specific pieces of industrial plant equipment to planned item requirements.
- o Identify impact on producer's capability of lending PEP equipment, in terms of planned item(s).
- o Facilitate management of PEP equipment inventory.

Thus, one producer's plant would have a specific PEP assigned as per current practice, but each planned item (for which supplementary Government-furnished equipment is required) would be identified to specific equipments. This refinement of PEP inventory is not in conflict with the authorizing Public Law 93-155 and would not require any change in current ASD authorization.

Other resources in addition to PEP's require identification and assessment. "Planned Item Production System" is defined by this study to include all the production related resources required to achieve effective mobilization; it is shown schematically in Figure IV-1.

2. Role of PEP's

PEP's constitute only a single element in a system for producing a planned item with a high level of readiness in the mobilization base; they do not constitute a system. PEP's must be reviewed, therefore, in the context of a total system for producing the planned item; i.e., the planned item production system. The total system is of primary importance because only the system can ensure the requisite response capability for producing a specific item. Without other complementary system elements, such as producer-owned equipment, even the most modern and efficient package of Government-owned manufacturing equipment may not, of itself, be capable of producing the planned item.

3. System Elements

Referring to Figure IV-1, the planned item production system is analyzed with respect to the three system elements of major significance:

- o Production resources
- o Government directives
- o Planning and control system

a. Production Resources. Production resources comprise both Government- and producer-owned equipment needed to perform the manufacturing function, together with the requisite technical documentation, personnel skills, and authorized funding. PEP equipment is shown (in Figure IV-1) as a part of the Government-owned complement; however, according to current practice in PEP identification, the PEP would not necessarily encompass all of the Government-furnished equipment required to produce a planned item. The production line includes all industrial plant equipment required, by description of manufacture, which defines how the planned item is to be manufactured. The industrial plant equipment (IPE) is augmented by special tooling (ST) and special test equipment (STE).

Figure IV-1 also shows other plant equipment (OPE), as included in the proposed system, when it constitutes a significant requirement. Major items of material handling equipment are included in the OPE category.

The producer-owned complement of resources is indicated as another major element in the planned item production line of Figure IV-1. The Army does not generally maintain data on producer-owned equipment such as its inventory, condition, or planned item capability. This lack of data on producer-owned equipment imposes a restriction on the Army's industrial preparedness planning capability. The current PEP Modernization Program will provide some of these data on a one-time basis for selected producers in the program.

Figure IV-1 depicts three other categories of production resources:

1) Funding. Funding represents the cost incurred by producers in the performance of mobilization planning, production engineering, update of technical data, and equipment purchase, installation, maintenance, modernization, and operation. The mobilization planning task includes alignment of subcontractors, critical materials, vendors, and suppliers. These costs, if not defrayed by the Government, will be an overhead charge that could be recovered only through current procurement or facility contracts that allow for payment of these charges. Without such contracts as an adjunct to a mobilization agreement, the producer would not be compensated for the costs of mobilization planning. A likely alternative for the producer is nonaccomplishment of requisite mobilization planning. Subsection V.C discusses this problem further.

2) Skills. The skills data depicted in Figure IV-1 include such required technical disciplines as management, manufacturing engineering, production planning, test, and quality assurance in addition to the needed hands-on production line skills. The development and maintenance of an effective manpower team can be of equal or greater importance than the availability of plant equipment. It is not always a valid assumption that talents required for specialized munitions production are readily transferable from commercial work. Therefore, assessment of producer capability is incomplete without considering skill requirements. Section VII addresses skills.

3) Engineering Data. Technical documentation originates from Government sources and is subject to continuous update. Production resources are incomplete unless the producer has technical data packages (TDP's) and the associated specifications containing all recent design changes to the planned item. Section VIII elaborates on this subject.

b. Government Directives

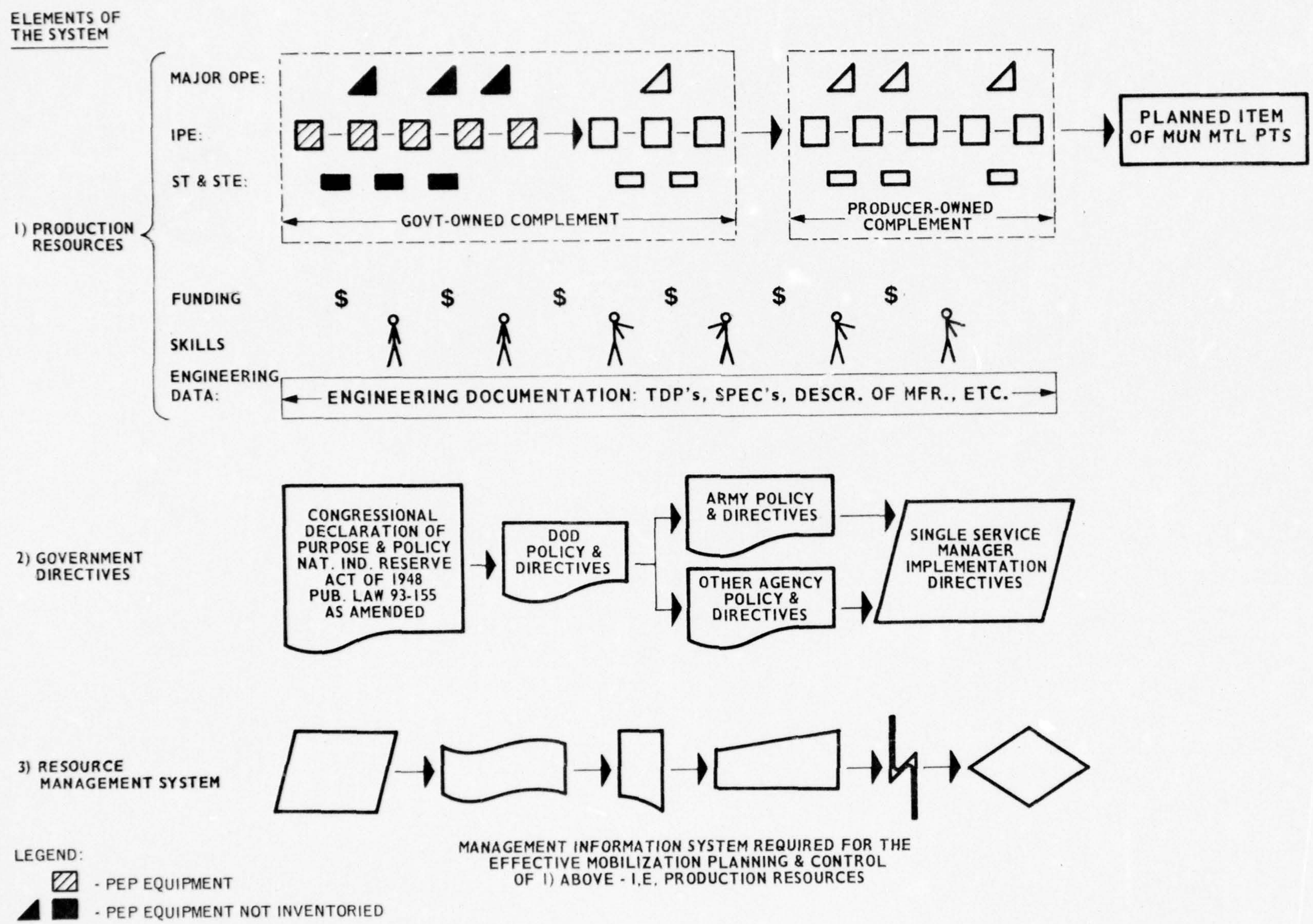
The second major element of the planned item production system is the Government's directives and instructions, which define policy and otherwise authorize and implement the planned item production system. This documentation is shown stemming from Public Law 93-155 thrugh descending levels, from OSD through ARRCOM. Section IX presents an analysis of current PEP directives.

c. Management Systems

Although not currently in existence, a computer-based resource management system is postulated as the third major element in the planned item production system of Figure IV-1. This system identifies, inventories, and assesses production resources in terms of condition and capability, and administers, updates, and controls them to ensure attainment of planned production requirements. It projects basic materials leadtime requirements for M-day items. It identifies the skills base, both existing and required, and thus provides the means for the replanning of items to better fit available skills. Effective management requires that the constant changes that characterize base requirements and capabilities be continuously subject to updating. Thus, industrial preparedness planning requires a relatively large, complex data bank, with wide fluctuation of both input data and model parameters. Consequently, ARRCOM's production base management function has been evaluated as requiring a computer-based system. Section X addresses the proposed computer-based system for modernizing PEP resource management.

FIGURE IV - 1

PLANNED ITEM PRODUCTION SYSTEM
FOR MUNITIONS METAL PARTS PLANNED
PRODUCTION IN THE PRIVATE SECTOR



V. INDUSTRIAL PREPAREDNESS

A. GENERAL

Industrial preparedness as related to the various aspects of PEP's is discussed in this section. Data on the planned producers obtained from DIPEC records were evaluated, summarized and are presented in Subsection B. There are anomalies inherent in the type of data available, because the computer printouts vary slightly with changing conditions. As a result, the numbers of PEP's varied from month to month, and some data were based on a 100-PEP DIPEC listing and other data on 97 PEP's. To meet the constraints of the task assignments, updating of these data was discontinued early in calendar year 1976.

Those Government policies and practices applicable to current procurement and mobilization planning that have particular relevance to PEP's are discussed in Subsection C. This discussion does not encompass total Army industrial preparedness planning and procurement policies and practices; rather, it focuses only on those significant to PEP's. Subsection D notes the potential capabilities of planned producers based on data developed in the 42 on-site surveys performed by the KE/SAI PEP Modernization Program teams.

Predecessor studies, RAMP and SCRAM, are discussed in Subsection E, in the light of the findings of the current B-9 task. The withdrawal of producers from the base is discussed in Subsection F.

B. DIPEC SURVEY

1. PEP Categories

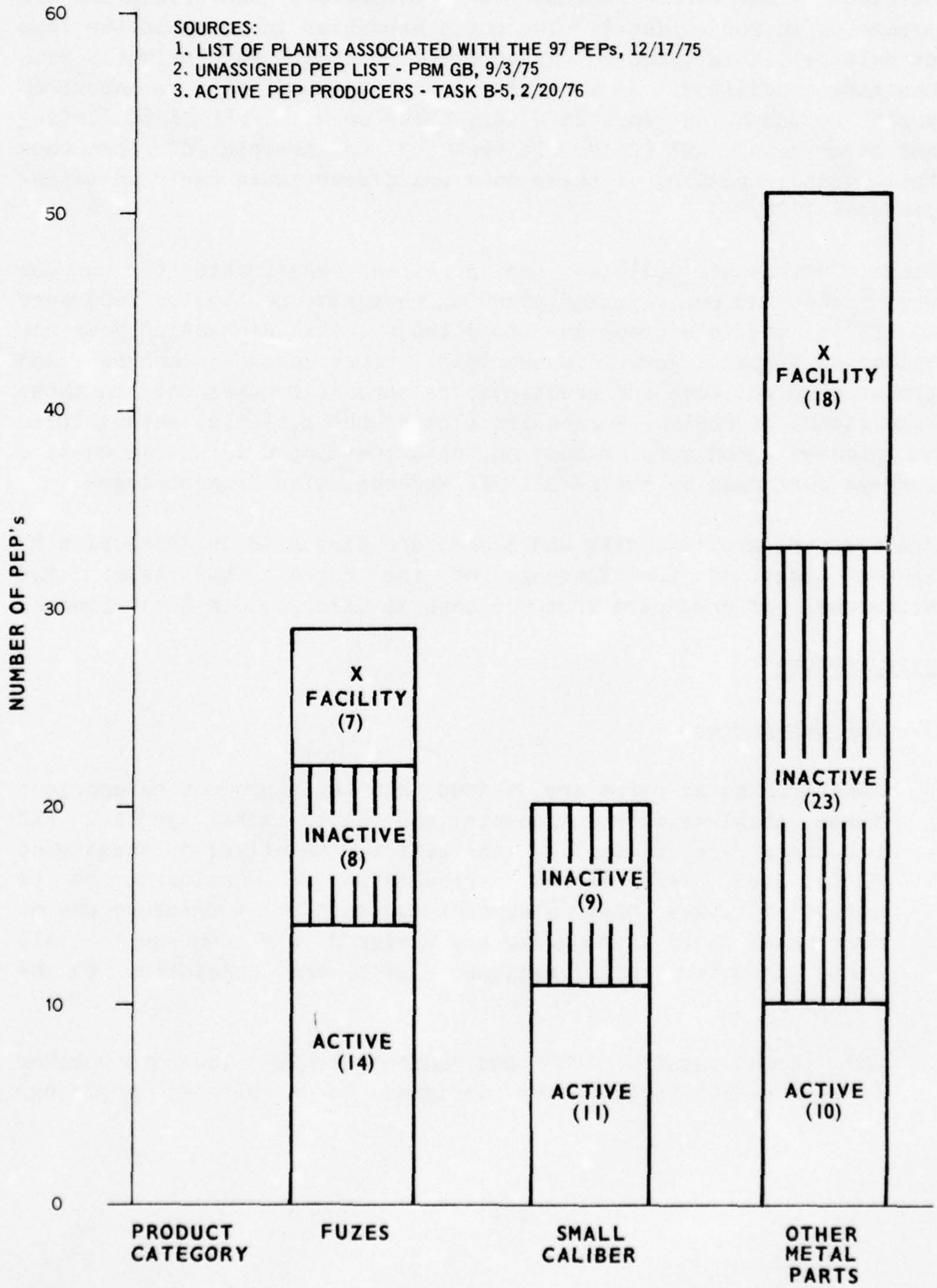
Munitions metal parts are divided into three product categories; fuzes, small-caliber components, and other metal parts. PEP producers are classified as active, inactive, or unassigned PEP's; i.e., X-facilities. Producers are considered to be active if they have a current contract to manufacture one or more metal parts items using any assigned PEP equipment. All other producers with assigned PEP's are considered to be inactive.

The terms "assigned PEP" and "unassigned PEP" indicate whether or not the PEP is currently assigned to a planned producer.

FIGURE V - 1

PEP PRODUCER STATUS BY PRODUCT CATEGORY

ARMY MUNITIONS METAL PARTS PEP's



When a PEP is no longer assigned to a producer but has not been dissolved it is designated as an X-facility. Usually, a PEP is retained in X-facility status on a temporary basis until another producer accepts the assignment for current or mobilization production of the related planned item.

2. PEP Status

PEP status by product category is displayed in Figure V-1. Of the 100 PEP's included in this survey, 35 are active, 40 are inactive, and 25 are X-facilities. The 35 active PEP producers include 14 fuze producers, 11 small-caliber component producers, and 10 producers of other metal parts. Of the 40 inactive producers, 8 produce fuzes, 9 small-caliber components, and 23 other metal parts.

The 25 X-facilities consist of 7 fuze PEP's and 18 PEP's for other metal parts. X-facilities have become such primarily because the planned producers have voluntarily left the production base. Therefore, X-facilities do not represent a valid production capability because they are incomplete production lines without the equipment to be provided by a yet-to-be-assigned producer. The withdrawal of producers from the base is considered in Subsection F.

Portions of the industrial plant equipment in 16 of the 25 X-facilities are still located at the site of the formerly assigned producers. Figure V-2 presents the location of the 75 active and inactive PEP producers, all of which are located in the continental United States, primarily in the East and Midwest.

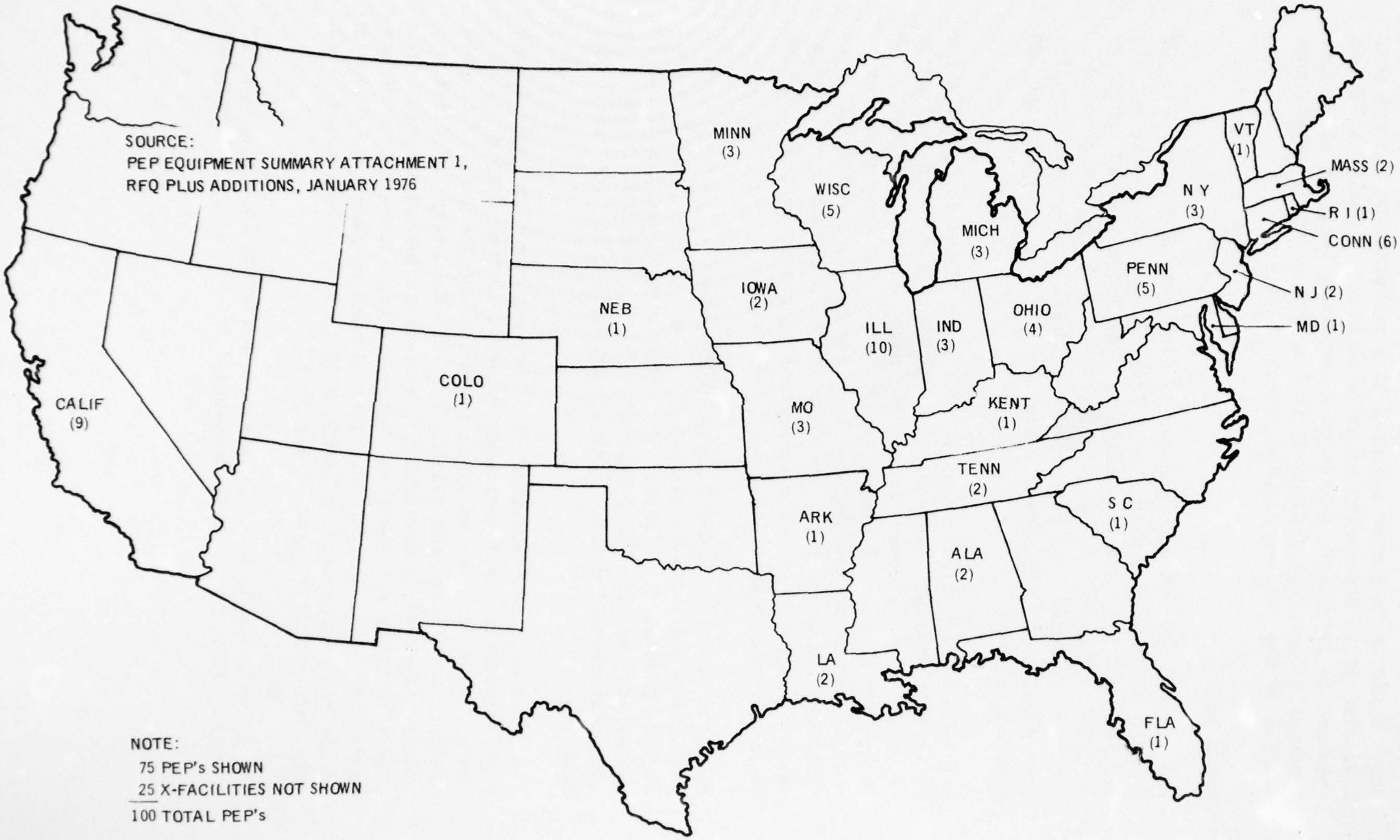
The greatest concentration of PEP producers is found in the highly industrialized northeast quadrant of the United States, where 68% of the assigned producers are located. This concentration reflects the availability of producers' facilities, skilled workers, power supply, and transportation in that area. Except for this northeastern concentration, the remainder of the PEP's are well dispersed. This dispersion meets the criteria established in Subsection 5-205, DSAM 4005.1, "Industrial Preparedness Planning Manual," May 1975.

Table V-1 lists the 75 planned producers by state, and the recorded quantity of Government-owned industrial plant equipment

FIGURE V - 2

QUANTITY AND LOCATION OF PEP PRODUCERS BY STATES

ARMY MUNITIONS METAL PARTS PEP's



SOURCE:
PEP EQUIPMENT SUMMARY ATTACHMENT 1,
RFQ PLUS ADDITIONS, JANUARY 1976

NOTE:
75 PEP's SHOWN
25 X-FACILITIES NOT SHOWN
100 TOTAL PEP's

TABLE V-1

PEPS AND PEP PRODUCERS BY STATE, FOR
75 ARMY MUNITIONS METAL PARTS PEPS
(EXCLUDING X-FACILITIES)

State	City (1)	Planned Producer (2)	PEP Number (3)	Status (4)	IPE Quantities PEP (5)	Total (6)
Alabama	Gadsen	General Time	757	Active	23	23
	Gadsen	Etowah Mfg. Co. Inc.	773	Inactive	49	70
Arkansas	Camden	Baldwin Electric Corp.	819	Inactive	2	2
California	Vernon	Norris Industries	098	Active	188	306
	Anaheim	Lear Siegler Inc.	208	Active	13	68
	Long Beach	Silent Industries	457	Active	191	252
	Costa Mesa	Wells Marine Inc.	465	Active	61	70
	Irvine	Barry L. Miller Eng. Co.	721	Active	10	10
	Anaheim	Northrup Electro	740	Active	250	567
	Santa Clara	FMC Corp.	742	Inactive	156	446
	Van Nuys	Marquardt Corp.	817	Inactive	5	269
	Torrance	Martin Marietta	842	Inactive	58	362
Colorado	Denver	Chaparral Ind. Inc.	832	Inactive	43	46
Connecticut	Watertown	Timex Corp.	196	Inactive	648	656
	Waterbury	Scovill Mfg. Co.	463	Inactive	49	72
	Meridan	International Silver	591	Inactive	8	8
	Thomaston	Plume and Atwood	598	Inactive	11	11
	Bridgeport	Remington Arms Co.	724	Inactive		
	Thomaston	Gen Time-Westclox	758	Active	153	161
Florida	Orlando	Dayron Corp.	759	Inactive	41	155
Illinois	E. Alton	Olin-Mathieson	069	Active	105	105
	Bellwood	Borg Warner	072	Active	3	3
	Chicago	American Home Products	200	Inactive	39	39
	Elk Grove	E. Walters Co. Inc.	219	Active	14	14
	Peru	Gen Time-Westclox	436	Active	268	326
	Chicago	Peerless of America	574	Inactive	179	179
	Rolling Meadow	Gen Time - Space Systems Div.	777	Active	58	58
	Marion	Olin-Mathieson ESD	787	Inactive	7	16
	Chicago	Bell & Howell	799	Inactive	69	69
	Marion	Olin-Mathieson ESD	801	Active	7	16
Indiana	Indianapolis	National Dist. & Chem. Co.	071	Inactive	27	27
	Lebanon	Stewart Warner Corp.	571	Inactive	128	144
	Indianapolis	Remco Hydro. Inc.	767	Inactive	11	11
Iowa	Newton	Maytag Co.	083	Inactive	159	159

State	City (1)	Planned Producer (2)	PEP Number (3)	Status (4)	IPE Quantities PEP (5)	IPE Quantities Total (6)
	Waterloo	Chamberlain	455	Active	474	482
Kentucky	Cattlettsburg	Calgon Corp.	722	Inactive	8	8
Louisiana	New Orleans	Rheem Mfg. Co.	167	Inactive	75	75
	Shreveport	Norris Ind. Inc.	744	Inactive	39	39
Maryland	Baltimore	Catalyst Res. Corp.	430	Inactive	49	76
Massachu-setts	New Bedford	Chamberlain	422	Active	460	502
	Attelboro	Texas Instruments Inc.	818	Inactive	9	9
Michigan	Jackson	Kelsey Hayes Co.	643	Active	111	111
	Plymouth	Assoc. Spring Corp.	651	Inactive	15	15
	Detroit	Revere Copper & Brass	804	Inactive	17	45
Minnesota	New Brighton	Honeywell Inc.	600	Active	423	649
	Anoka	Fed. Ctg. Corp.	732	Active	11	11
	St. Paul	Gould Inc.	811	Inactive	9	9
Missouri	St. Louis	Jackes Evans Mfg. Co.	065	Active	13	13
	St. Louis	Kisco Co. Inc.	753	Inactive	--	--
	St. Louis	Kisco Co. Inc.	768	Active	64	138
Nebraska	Ft. Calhoun	Wilkinson Mfg. Co.	786	Inactive	11	14
New Jersey	Mt. Laurel	Alcotronics	771	Inactive	3	4
	Wayne	REDM Corp.	780	Active	48	103
New York	Valley Stream	Bulova Watch S&I	763	Active	2	21
	Valley Stream	Bulova Watch Co.	782	Inactive	--	--
	Buffalo	Anaconda American Brass	805	Inactive	3	3
Ohio	Columbus	Clark Grave Vault	085	Inactive	97	97
	Cleveland	Weatherhead Co.	589	Inactive	194	194
	Galion	Galion Amco Corp.	762	Active	18	19
	Cincinnati	KDI Corp.	843	Active	60	65
Pennsyl-vania	Lancaster	Hamilton Technology	399	Active	114	867
	Philadelphia	Action Mfg. Co.	489	Active	5	5
	Red Lion	Flinchbaugh Products	602	Active	171	289
		MSL Ind/Garrett	656	Inactive	9	9
	Wilkes-Barre	Medico	766	Active	22	60
Rhode Island	Warwick	Bulova Watch ASD	781	Inactive	86	88
South Carolina	Conway	American Gear & Pinion	794	Active	13	207
Tennessee	Nashville	Temco Inc.	227	Active	32	57
	Dyersburg	Heckethorn Corp.	866	Active	--	--
Vermont	Bennington	Union Carbide Corp.	810	Inactive	124	139
Wisconsin	Eau Claire	National Presto	459	Active	381	452

State	City (1)	Planned Producer (2)	PEP Number (3)	Status (4)	IPE Quantities PEP (5)	Total (6)
	Milwaukee	Controls Comp. of America	580	Inactive	9	9
	Waukesha	Amron	737	Active	168	191
	Waukesha	Amron-Ritepoint	748	Active	166	411
	Janesville	Gibbs Mfg. & Res.	749	Inactive	15	16
TOTAL			75	35	6,561	10,222

TABLE V-2

PEP X-FACILITIES BY STATE FOR
ARMY MUNITIONS METAL PARTS

Location	Former Producer	PEP Number	IPE Quantities PEP	IPE Quantities Total
Illinois	Revere Copper & Brass	095	115	115
Massachusetts	Ward Machine Co.	166	12	12
Connecticut	McGraw Ed/Ingraham	192	72	72
Pennsylvania	Kennedy-VanSaun Mfg.	204	114	120
Pennsylvania	Lansdowne Steel & Iron Co.	211	248	248
Louisiana	Delta Southern	217	114	114
Ohio	G.D. Roper	221	112	112
Michigan	Gulf & Western	230	109	109
Iowa	John Deere	418	89	89
Iowa	Dunham Bush	420	112	112
Connecticut	Alcan Alum Corp.	423	30	30
Ohio	Zeller Corp.	437	44	44
Connecticut	Olin Mathieson Chem.	461	364	368
Illinois	Zenith Radio Corp.	468	82	82
Pennsylvania	Budd Comp.	570	166	166
Alabama	Alabama Industries	596	116	156
Arkansas	Ambac Industries	620	105	105
Michigan	Chrysler Corp.	630	138	138
Indiana	Avco Corp. Prec. Prod.	670	607	618
California	Aerojet Ord. Mfg. Co.	720	280	280
Massachusetts	Waltham Prec. Instru.	734	24	24
Ohio	Lear Seigler (Plant 1)	736	3	3
Tennessee	Airport Mach. Corp.	746	65	65
Utah	Murdock Mach. & Eng.	791	233	354
Michigan	Hayes Albion	795	30	30
Total		25	3,384	3,566

assigned. Column 5 lists the total PEP-assigned industrial plant equipment and Column 6 lists the total pieces of Government-owned industrial plant equipment at each plant. Table V-1 shows that out of the 75 plants, 32 had more Government-owned industrial plant equipment assigned than was listed in the respective PEP's, and total non-PEP Government-furnished equipment was 3,661 items, or about 36% of the total.

Table V-2 presents the current list of X-facilities. The former producers and their locations are shown together with DIPEC's recorded quantity of industrial plant equipment associated with each. PEP-assigned industrial plant equipment constitutes about 95% of the total Government-owned industrial plant equipment at the former producers. Attention is invited to the fact that this list of producers that have withdrawn from the mobilization base includes some prominent and otherwise capable firms, as well as some firms that are now defunct.

C. INDUSTRIAL PREPAREDNESS PLANNING AND CURRENT PROCUREMENT

1. Integrated Planning

a. Policy

Department of the Army policy (as stated in ARMCOM briefing "Integrated Production Planning," October 1975) is to achieve integration of industrial preparedness, modernization and expansion, and procurement and production planning. These interrelated activities essentially constitute the foundation for the mobilization base; hence, they must be compatible and mutually beneficial. Peacetime procurement provides the only current semblance of a hot base, thus it has a major impact on the ability of the base to respond at mobilization. Therefore, this study of the PEP concept includes a limited review of industrial preparedness and current procurement policies and practices, with particular reference to their impact on planned producer capability.

b. PEP Concept

An oral briefing by the ARMCOM staff in February 1975 provided the following points of information on the history of the PEP concept. The PEP concept did not grow out of World

War II; rather, it resulted from the provisioning problems of the Korean conflict. Most of the World War II production capacity was dissipated by 1949, and renewed munitions production required lead times up to 24 months.

At the conclusion of the Korean conflict, the Army established the policy of retaining as large a munitions capability as feasible in the private sector. In furtherance of this policy, an important step was made in the mid-1950's by authorizing retention of much of the large inventory of Government-owned equipment then existing. Initially referred to as ASOD's in reference to authority of the Assistant Secretary of Defense, the equipment in each plant was later designated as a plant equipment package (PEP).

As has been noted, the objective of the PEP concept is to augment privately-owned inventories with Government-owned equipment, thereby ensuring the availability of an industrial production capability to meet requirements for national defense. PEP's were eminently successful in achieving this objective in the Southeast Asia conflict. In a briefing presented to Admiral Eli Reich, Deputy Assistant Secretary of Defense (I&L) in April 1971, it was stated that IPE management (i.e., PEP's) between the Korea and the Southeast Asia conflicts improved buildup substantially by comparison to the pre-Korean time period and is given credit for the major reduction in buildup time for Southeast Asia. The conclusion reached was: "We reduced the leadtime for response to the emergency needs for ammunition from the 12-18 months experienced in Korea to a period of 6-9 months for the buildup in Vietnam." This conclusion reflected a buildup for all of the facilities, whether they were on site, in a relatively high state of readiness, or offsite in central storage.

c. Core-Facility Concept

Current mobilization requirements emphasize a high state of readiness and early (within 180 days) response for a wide range of critical items. As a result, the current emphasis on industrial preparedness has, to some degree, shifted to stockpiling planned items as a supplement or alternative to developing the capability to produce them in a timely manner from the mobilization base.

The core-facility concept of peacetime procurement, which is currently being considered, would also emphasize stockpiling as distinguished from the PEP concept, which highlights readiness. As currently defined, the core-facility concept would provide for the selection of a core producer if there is a sufficient requirement level for an item to sustain a production contract. The selection of a core producer would be based on his meeting certain criteria, including: (a) previous high-quality performance; (b) technical experience on previous contracts; (c) the contractor's acceptance of the time/production schedule; (d) favorable economic history of the firm;(e) the producer's flexibility for production of multiple products, and; (f) the producer's ability to supply the needed skills.

If the required level of production is sufficient to keep more than one core producer active, then two or more core producers would be identified as the producers for a given planned item of a family of planned items. The core producers would agree to provide the capability to produce at a minimum sustaining rate (MSR); they would be workloaded accordingly by the Government. Any procurement above the MSR, however, would be subject to competition. The core producers would have to accept a penalty in the event of large procurements, to offset their competitive advantage by virtue of being a part of the core.

The Government would use foreign military sales as an additional production workload on the core facilities and as an added factor of assurance for retaining the core facilities. If any producer is excluded from the core, he is essentially excluded from peacetime production, because MSR will meet the requirements in most cases. Peacetime production is the only significant incentive for a producer to participate in industrial preparedness. Thus, the core facility concept, if implemented, could result in a significant decrease in the private sector's participation in industrial preparedness. By predetermining those producers that the Government intends to keep in operation, it could also lessen dependence of industrial preparedness on the readiness of inactive PEP mobilization producers.

2. Base Capability Considerations

a. Private Sector Withdrawals

Recent trends indicate a withdrawal of capable firms from the munitions base--about 15 within the past 2 years, as stated by ARRCOM staff. This trend appears to be typical of defense procurement generally; some 25 contractors have withdrawn from Air Force procurement within the past year, as disclosed by a representative of the Assistant Secretary of Defense at an American Defense Preparedness Association meeting on 3 February 1976 at Davenport, Iowa.

The Defense Department is currently promulgating a series of industrial base enhancement initiatives that are designed to encourage participation as defense industries. It is possible that the attrition of the base in terms of numbers of producers could in fact be a favorable development if the capabilities of the remaining producers were being concurrently upgraded. In this context, producer capability should improve in the areas of corporate financial stability, technical competence and depth, and managerial ability.

b. Government Support

Department of the Army policy is stated in AR 700-90: "DA depends on private industry as the foundation for production of military material." However, peacetime cooperation by the private sector is on a voluntary basis; as stated in DOD 4005.3-M,"...the participation of industrial management in the (Mobilization) Program, while vital to its success, is entirely voluntary. Mobilization production plans will not be effected for privately owned facilities without the consent and cooperation of management."

As discussed in Section IV, the production system that is needed to produce a planned item under the PEP concept includes the planned producer's own resources. However, planned producers may be unwilling or unable to use or maintain their own equipment, which is integral to the production capability retained in a PEP. If so, current policy permits an industrial preparedness measure for a facilities

expansion or acquisition to provide the additional production capacity needed to meet emergency requirements.

The level to which Government-owned assets are required to supplement those of the producer is, to a significant degree, dependent on the capability of firms brought into the mobilization base. The current practice is to augment the producer's equipment with PEP's and to award facilities contracts as incentives to encourage participation in the base. This practice permits highly leveraged firms with low overhead and minimal privately owned inhouse equipment commitments to obtain up to 100% of needed planned item production equipment from Government PEP's. Thus, the policy of providing ready availability of PEP's encourages producers, who otherwise may never have an interest in munitions programs, to participate. Significantly, many of these producers have marginal inhouse resources; as an example of the current level of Government support, 7 of the first 14 active producers surveyed in this program were assigned PEP equipment that constituted more than 90% of the equipment required for committed planned item production. This equipment inventory is primarily standard machinery, as distinguished from special-purpose equipment that is unique to munitions metal parts production. Consequently, some planned producers are approaching a status of being paid to operate Government-owned equipment.

c. Planned Producer Evaluation Factors

Government policy in bid evaluation is an important factor in determining the capability of base producers under conditions of reduced peacetime procurement. Practices that have occurred within the experience of members of the PEP program teams or that have come to their attention include the following:

- Directing procurements toward labor surplus areas. Although this might be economically beneficial for the urban areas selected, it may not be in the best interests of military industrial preparedness, because the under-managed and under-financed producers are frequently located in the same areas.

- Using the evaluation factor, with the effect of benefiting metal parts producers located closer to the explosive loading plants. The latter are located largely in the South, out of the highly industrialized areas. This practice could have the effect of giving a competitive advantage to metal parts companies located near explosive plants.

- Retaining existing equipment, because the current equipment evaluation factor is weighted in favor of using old equipment. For example: a Government-furnished 1956 Acme Gridley 8-spindle automatic that had an original acquisition cost of about $36,000 would have an imputed charge against the bidder on the basis of 0.75% per month, or $270 per month. A rebuilt 1956 machine would cost about $75,000 with an imputed charge of $1,500 per month. A new 1976 machine would cost about $120,000 or $2,500 with an imputed charge of $3,000 per month. Therefore the availability of Government-owned equipment to a current PEP producer with a monthly evaluation of only $270 represents a strong competitive advantage by comparison to another bidder trying to purchase his own equipment, either new or rebuilt. Furthermore, if the Government were to provide a new machine to a current PEP producer or a new bidder, it would cost either bidder who was planning to use the machine an imputed charge of about $3,600 per month. Consequently, producers prefer to rebuild old machines rather than upgrade with new equipment that may be more productive, safer, and meet OSHA specifications.

  This practice: (a) essentially penalizes equipment modernization; (b) penalizes the producer who is willing to make a capital investment for his own equipment, but favors the producer who has been provided older Government-owned equipment; (c) gives a further advantage to a producer with Government-owned equipment, which normally includes unevaluated accessories and tooling, since acquisition cost reflects only the basic machine without these accessories and tooling and; (d) tends to increase dependence on PEP's.

d. Planned Producer Incentives

Current procurement programs provide an incentive for industry to participate in mobilization planning in that current procedures require soliciting planned producers first for all procurements over $2,500, on items for which they have executed DD Form 1519's.

A significant incentive is Exception 16 of ASPR 3-216. This exception permits a procurement to be limited to, and negotiated with, planned producers and is currently being liberally invoked. This would tend to attract and retain stronger, better staffed producers possessing the essential resources of manpower and skills for mobilization capability. Use of the exception is also judged to encourage the producers' participation in industrial preparedness planning.

There are certain benefits to be realized in using Exception 16. A planned producer normally possesses the staff and other resources needed to meet mobilization production levels; typically, such areas as manufacturing engineering, quality control, and other staff activities of the larger firms could be cited. Retention of these capabilities implies overhead costs that could penalize the planned producer in a competitive procurement at current production levels. Smaller firms outside of the base, yet possessing adequate capacity for the current procurement, would be in a most advantageous position by virtue of lower overhead costs.

Exception 16 tends to obviate this risk for the planned producer, thereby assuring the opportunity for: (a) maintaining an effective mobilization capability, including the development of necessary skills, and; (b) some return for industrial preparedness planning efforts.

e. Contractual Policy

Sound corporate planning by the private sector is affected by the cyclical nature of munitions procurement, which is characterized by short-term contracts. The Defense Department has recognized this situation, and one stated initiative to enhance attractiveness of defense procurement is the

adoption of a multiyear contract policy. This policy initiative can be expected to have a major and favorable impact on stability of the base.

If a private producer acquires equipment on which cost is amortized over the life of a current procurement contract, then the Army, under the terms of the contract, secures title to the equipment. Army-owned industrial plant equipment had an aggregate acquisition cost of $1.2 billion as of late 1974; approximately one half of that figure is invested in PEP equipment as of December 1975.

Discussions with industry and plant management have highlighted the cyclical nature of munitions procurement, which discourages producer participation in the base. Other prime causes for lack of participation have been cited: the many complex Government procedures, the required documentation demonstrating adherence to procedures, and the excessive interface requirements with Government personnel. Current production requires: (a) a detailed effort to obtain a contract; (b) continued complex record keeping and inspections during its performance, and; (c) frequent Government postcontract audits and inspections. Figure V-3 depicts graphically the potential exposure of a typical munitions contractor to Government scrutiny.

3. Industrial Preparedness Planning Procedures

a. The Role of DD Form 1519

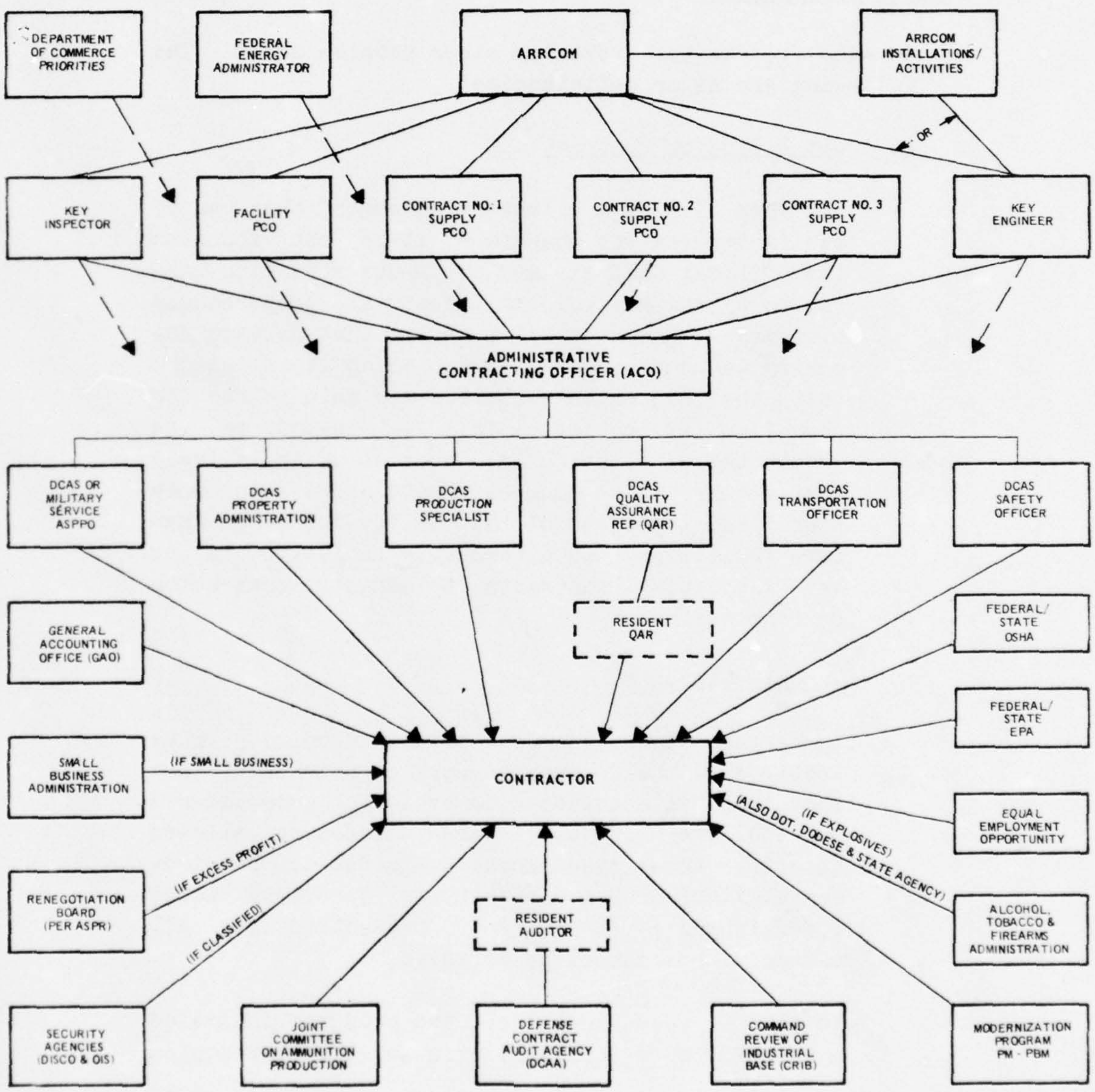
DD Form 1519 is the documented, nonbinding agreement reached between the Government and a planned producer with respect to mobilization production of specified items. It is the source document used by Government planners to define mobilization base capability and capacity. The validity of the entire industrial preparedness planning effort depends on the accuracy of the data developed from the compilation of DD 1519's.

Several conferences and papers pertaining to various aspects of industrial preparedness have pointed out the shortcomings of DD Form 1519's. These include the following:

- RAMP Study

FIGURE V - 3

GOVERNMENT/CONTRACTOR INTERFACE



- JCAP Lead Time Study
- Joint Logistics Review Board Study, headed by Gen. Besson
- ADPA Seminar at Davenport, Iowa, in February 1976

All of these concluded that dependence is placed on DD 1519 data to generate the mobilization schedule, but that there is no assurance that either the data or the schedules from the DD 1519's are valid.

1) <u>Major Deficiencies</u>

On-site visits have revealed other problem areas. The following are major deficiencies:

a) <u>Not a Binding Contract</u>

DD Form 1519 is a voluntary agreement that can be easily terminated; therefore, it is not accorded the critical analysis and corporate attention warranted by its key role in industrial preparedness planning. The underlying reason that private industry wants to make DD 1519 binding is to ensure that the contractor becomes the sole source for peacetime production. This is deemed to be unacceptable politically, because it is unlikely that either DOD or Congress would approve the sole source implications of that policy for other than core facilities. An alternative solution is to use facilities contracts to ensure contractor performance.

b) <u>Unrealistic Data</u>

In certain cases, the lead times and buildup rates required by the Government were questionable, but the producer acquiesced to avoid being considered unresponsive. In other cases, pressure allowed capacity to be overallocated against the requirements. This practice results in producers being "overplanned"; concurrent production for all planned items cannot be achieved.

In some of these instances, the producer indicated a need for more equipment or a facility expansion

on the DD Form 1519. (The information includes equipment voids in established lines as well as new lines). Such an example is found on DD Form 1519's from Chamberlain Manufacturing Corporation (PEP's 422 and 455). The equipment voids indicated on the DD 1519 by the New Bedford Division of Chamberlain (PEP 422) have been noted yearly. Thus, the inability to meet mobilization requirements is established on the DD 1519, yet planning continues as though the planned items will be available during mobilization.

In the case of the Waterloo Division of Chamberlain (PEP 455), the discrepancy between assumed production capability and that documented by DD 1519 is even more strongly delineated. The DD 1519 for planned items M84E1 and M60, 105-mm metal parts, clearly states a definite need for additional equipment to meet mobilization requirements, as well as for real estate and a building to house the production line. Under the circumstances, M-day requirements would obviously be impossible to meet unless such voids are filled. Planning should be accomplished using only existing available production resources.

c) <u>Technical Data Availability</u>

Planned producers not having current production contracts have indicated a lack of confidence in the technical data for producing the planned items. Each year, when the DD Form 1519 was renewed, neither the Government nor the producer could ascertain whether the engineering data for the planned item had been revised.

Revisions to technical data for planned items could greatly affect tooling, processes, and equipment. It is essential that the planned producer have the latest revision of the significant technical data required for production during mobilization response. DD Form 1519's should specify the applicable engineering item numbers

and the effective revision and date for each. This subject is discussed in detail in Section VIII.

d) <u>Lack of Production Planning</u>

The armed services have authority to budget for, and to request allocation of funds to pay for, a producer's industrial preparedness planning in connection with DD 1519's; however, it has not been Army practice to do so in the private sector. Even when facilities are available and equipment on site, KE/SAI onsite surveys disclosed that relatively few producers have planned adequately for mobilization production. Many of the producers with industrial plant equipment in storage have not assigned any of the equipment to specific production operations. Also, some producers have limited inhouse or, in some cases, no engineering capabilities for mobilization planning. The ability to produce as per the commitment is questionable, because the capability has not been validated by the requisite production planning. The reason cited by the producers is that mobilization planning costs are not reimbursed and, consequently, planning is given a low priority. Expenditures for mobilization planning increase overhead, and a competitive position requires minimizing overhead costs.

There has been no compensation for subcontractor planning. Government policy has been to rely on the planned item producer to align the subcontract support necessary to ensure adequate and timely delivery by the prime contractor. This assumption is extended, tier by tier, through all the major subassemblies and pacing components. Subcontractor planning is not being adequately accomplished.

As a result, the key data elements contained in the DD Form 1519's have not been validated by adequate production planning and the requisite manufacturing engineering. An ongoing technical audit function is needed by the Army to assess producer

capability and to validate the data contained in the DD 1519's.

2) Recommendations to Improve DD Form 1519

a) Audit Teams

If DD 1519's are implemented properly, they are a useful and satisfactory instrument for industrial preparedness planning. Implementation requires a cadre of qualified shop and machine tool specialists with strong munitions manufacturing and process backgrounds to provide the interface with and perform the audit of each plant. This audit team should be under ARRCOM control, and it would replace the current ad hoc CA, CD, and CRIB teams. Having a full-time audit capability to validate essential DD Form 1519 data would enable ARRCOM to provide the needed sophistication in future industrial preparedness planning. It would, for example, provide validated data to analyze trade-off considerations of buying an inventory versus providing facilities for a given munitions system.

b) Proposed Implementation Procedure

- o Determine that all planned item requirements data are at an acceptable level of detail and accuracy.
- o Obtain names of candidate producers that are qualified and available to produce each planned item.
- o Survey each plant, comparing it to a benchmark of production process, equipment requirements, and QA plans. Equipment available would be allocated and its condition determined. The capabilities of each producer in terms of skills and facilities would also be determined, and the financial condition of the company surveyed would be reviewed.

- Select a producer on the basis of the data gathered, using an allocation model to ensure the greatest capability from the given resources. The selected producer would be informed of a workable process to produce the planned item. He will be asked, "How much equipment would he assign to this effort and how much would he buy?" ARRCOM could then determine the equipment needed to fill voids.

- The selected producer would be provided with all details pertinent to M-day production, including security and quality assurance requirements; thus, the industrial preparedness planning effort would be accomplished for the producers.

- If the acquisition cost of Government-furnished equipment to be provided to the selected producer is $50,000 or more, a facilities contract would be negotiated that would provide for a mobilization production commitment on the part of the producer.

- The producer would then sign the DD Form 1519 and (where applicable) the facilities contract.

- On a periodic basis, selected members of the ARRCOM audit team would contact each producer, ensure that current pertinent technical data are available, ascertain the continued capability to meet mobilization production commitments, and assist in the identification and resolution of mobilization planning problems.

b. Facilities Contracts

A facilities contract is required by ASPR when the acquisition cost of Government-furnished equipment at a producer's plant exceeds $50,000. There does not have to be a DD Form 1519 for the producer, the facilities contract providing a holding and accounting instrument for the Government-furnished equipment. All PEP producers having Government-furnished equipment worth over $50,000 on site are given

facilities contracts. These are all basically the same in content; they do not, however, apply to non-PEP producers or PEP's stored in Government storage.

There are two kinds of facilities contracts: facilities-use contracts, primarily for non-base producers, which provide the vehicle for a contractor to institute property control and maintenance of Government equipment, and consolidated facilities contracts that cover everything in the facilities use contract and, in addition, allow the contractor to acquire equipment for the Government's account, rehabilitate existing equipment, lay equipment away, and perform abnormal maintenance as required.

The major difficulty with layaway contracts is that there is currently no provision for escalation or renegotiation. For example, Clark Grave Vault (PEP 085) has been receiving $63,000/year since 1964, and the amount has never been increased. The change in real purchasing power in the interim implies a potential degradation of maintenance in terms of type, frequency, and quality. The facilities contract covers maintenance of Government equipment, and it has to be renewed annually.

A previously stated deficiency in the application of DD Form 1519 data to industrial preparedness planning is the absence of a firm commitment on the part of the private producer to perform mobilization production and to retain the capability for doing so. Since a contractor can be compensated for any reasonable and relevant purpose under a facilities contract, it appears that the facilities contractual procedure can be utilized to ensure a mobilization production commitment without compromising the Government's peacetime procurement options. It is recommended that this alternative approach be explored and, if judged feasible, be considered for implementation.

In this regard, the details to be addressed in planning mobilization production should include the following:

o All Government furnished technical data, with provisions for periodic updating, should be specified.

- Total significant resources to be furnished by both the Government and the producers should be identified, including descriptions of manufacture, rates, work flow, etc. (refer to Section VIII for details).

- The Government should guarantee availability of critical materials.

- Recognizing that most firms will require substantial additional capital to finance planned production rates, Government loan guarantees for operating capital should be considered.

- Consideration should be given to the potential incentive of additional tax writeoffs against committed equipment for defense contractors who are willing to consider capital investment for mobilization programs.

D. PRODUCER CAPABILITIES

Producer capabilities for mobilization production were evaluated from data secured in on-site visits to the 42 planned producers on the PEP Modernization Program schedule. These 42 plants constitute a reasonable sample of the existing active PEP base, with 11 small-caliber producers, 15 in metal parts categories, and 16 fuze producers (the LAP category producers are GOCO's). Approximately one-third of these plants are small business concerns and the balance are divisions or subsidiaries of substantial corporations; thus, the sample represents a fair spectrum of producer capabilities.

1. Review Criteria

The review of producer capabilities was confined to a subjective evaluation of information collected according to the criteria considered by each field team. The on-site visits were made specifically to gather data on existing and required production line equipment; other capability oriented criteria (e.g., management skills, financial backing) were not studied or evaluated. Therefore, the data reviewed do not represent the entire spectrum of considerations that would be appropriate to a comprehensive analysis of an individual producer's total capability. Details of each plant visit and specific data

collected are included in the Task B-5 plant reports (See XI.C, Bibliography).

2. Review Findings

Summarizing the information developed by the field teams, the findings from reviewing the 42 producers are listed below.

- Performance of producers in mobilization planning:
  - Fifteen have established plans for mobilization
  - Thirteen have some limited planning accomplished
  - Twelve have no mobilization plans
  - Two declined to state

- Sufficient commercial work to sustain operations and retain skilled help during periods of low military requirements:
  - Eighteen have over 90% military production, with 12 of the 18 having 100% military contract work
  - Seventeen producers have 50% to 90% commercial production to sustain them when military production contracts are not available
  - Five producers have approximately 30% commercial production
  - Two producers declined to state

- Engineering staff experienced in manufacturing current and planned items:
  - Thirty-four of the 42 producers were judged to have an adequate staff and engineering capabilities

- Complete and up-to-date plant layouts:
  - Twenty producers had plant layouts with production equipment locations depicted
  - Four producers declined disclosure

- o Production equipment inventoried, marked, documented, and assigned to specific operations for mobilization planned items:
  - Thirty producers had industrial plant equipment assigned to specific production operations for planned items
  - Two producers declined disclosure
- o Complete technical data packages (TDP) including latest revisions:
  - Thirteen producers had relevant but partially obsolete TDP's available in their files
  - Twenty-three producers had TDP's for current contract items only
  - Two producers had current but incomplete TDP's
  - Three producers had no TDP's
  - Two producers declined to state
  - Producers stated that up-to-date TDP information was not available to them unless they were producing for a current contract or bidding for one.

  (Note: TDP's for 46 PEP's assigned to 42 producers).
- o Full compliance with OSHA and pollution abatement requirements:
  - Five producers have had OSHA inspections with no violations cited
  - Three producers are considered qualified to pass OSHA inspection; 25 definitely require upgrading to OSHA standards
  - Ten producers currently have pollution problems with at least one producer cited by OSHA inspectors

- All 42 producers would experience noise, air, and water pollution problems during production of required mobilization quantities

o Documented quality assurance program in compliance with military standards, including gauge laboratory and testing facilities:

  - Thirty-two producers had good quality assurance programs

  - Four producers would require upgraded quality assurance programs for mobilization quantity requirements

  - Three producers would have to develop quality assurance programs

  - One producer had no inhouse facilities

  - Two producers declined disclosure of programs

o Tooling capability for designing, manufacturing, and maintaining required tools and gauges varied significantly:

  - Twenty-two producers could make and maintain their own tools

  - Two producers could make some new tools and maintain all their own tools

  - Nine producers had the capability to maintain all their tools, but new tools were purchased from other sources

  - Six producers had only limited tooling maintenance capability, and external procurement of new tools

  - One producer obtained all tools and maintenance services from a nearby affiliate company

  - Two producers had all tooling work, new and maintenance, performed outside of the plant.

o Laboratory facilities for materials and process chemical testing:

- Twenty-seven producers had adequate to good laboratory facilities for all process testing

- Eight producers had limited laboratory facilities for a few in-house tests of production chemicals

- Five producers had no laboratory facilities

- Two producers declined disclosure

o Adequate facility for concurrent production and material storage of all mobilization planned items:

- Thirty-two planned producers had manufacturing plants large enough to handle mobilization quantities

3. Summary of Producer Capabilities

Twenty-four active producers were evaluated in terms of the 11 significant criteria listed in Subsection 2; these did not include management and financial capabilities. Results of the survey indicate the following:

o None of the 24 producers met all 11 criteria.

o About 21% of the firms lacked engineering staff capability and QA resources.

o About one third of the firms surveyed lacked adequate facility space for mobilization production/storage, or lacked plant layout drawings and IPE control data.

o More than half of the firms have OSHA and pollution problems; lacked tooling production capability, TDP's, laboratory facilities, and adequate mobilization planning; and were substantially dependent on military work.

o Based on this sample of representative active producers, the ability of existing PEP producers to meet planned mobilization assignments must be validated.

E. RELATED STUDIES

1. General

Two major studies related to the current study were completed in 1975:

- o Review of Army Mobilization Planning (RAMP).
- o Standing Committee for Readiness of Army Materiel (SCRAM) Report, Peacetime Acceleration Planning, 30 October 1975.

RAMP is a HQDA/AMC study of mobilization planning, approved by the Secretary of the Army on 18 August 1975. SCRAM is an AMC study that addresses planning for accelerated deliveries and expanded production to support allies during peacetime. Another study, by Arthur D. Little, Inc., for the Arms Control and Disarmament Agency in 1974, generally corroborates the need for improving and modernizing industrial preparedness planning. This study is cited in Section I.

The following paragraphs summarize major findings and recommendations of the RAMP and SCRAM studies; the KE/SAI position on each, as developed in this report, is included. Each paragraph identifies a basic task proposed in the RAMP study. These were approved and implementing actions authorized by the Secretary of the Army on 18 August 1975.

2. Assumptions for Industrial Preparedness Planning

a. RAMP-1 Comments

Assumptions of questionable validity have been invoked for industrial preparedness planning, to the point of assuming away virtually every potential problem area. Particularly noted is the statement that manpower, skills, raw materials, and industrial plant equipment will be available in proper quantities and in time to meet leadtime and production rates noted on the DD Form 1519. Conditions short of mobilization should induce further concern for the validity of these assumptions. They should be reevaluated.

b. SCRAM Comments

It is assumed that PEP utilization (under peacetime acceleration) will be based on actual condition and location; on the other hand, Army industrial preparedness planning is conducted under the assumption of national emergency and a directed economy, which is incompatible with peacetime acceleration planning. The SCRAM study assumptions, therefore, were based on existing current conditions and not under a National Emergency in which the full authority of the Defense Production Act could be invoked.

c. KE/SAI Comments

KE/SAI concur with the RAMP study, that assumptions regarding DD 1519 data are questionable. However, these data constitute the basis for all capability planning for industrial preparedness, (including contingency planning for U.S. allies); there is no substitute for the validity of inputs in formulating a feasible plan. It is recommended that industrial preparedness planning data be upgraded by the following methods to ensure that the assumptions are valid:

- Establish an ongoing audit capability at ARRCOM to ensure that leadtime and production rate data entered on DD Form 1519 are accurate.

- Implement facilities contracts to commit the private sector for production under either peacetime acceleration or mobilization conditions.

- Enhance ARRCOM industrial preparedness planning capability to cope with an industrial preparedness situation characterized by constant change, high level of required readiness, and high-volume data processing.

The SCRAM assumption about PEP utilization under actual conditions and locations is a realistic approach. However, the data are still vulnerable to challenge, except where PEP Modernization Program Task B-5 has provided improvement. In the latter case, it was a one-time task, and there were no provisions made for regular updating. The aforementioned recommendations for upgrading industrial preparedness planning data would also apply in this situation.

In summary, the KE/SAI position is that the assumptions about the readiness posture should be validated or otherwise quantified in terms of response capability. What is needed is a dynamic planning system that has validity under differing scenarios ranging from a limited conflict to full mobilization. A needed first step is to improve industrial preparedness planning methodology and data validity as recommended herein.

3. Peacetime Acceleration

a. RAMP-2 Comments

RAMP-2 recommends that HQDA review the SCRAM report to determine the need for policy changes or additional study. Industrial preparedness planning is not a substitute for peacetime acceleration planning, because of mobilization assumptions.

b. SCRAM Comments

SCRAM can provide needed planning data to address accelerated acquisition and/or increased production of selected items. A full time planning entity should be established at HQAMC to implement the peacetime acceleration planning system proposed by SCRAM, and its counterparts should exist at major subordinate commands or program managers' offices.

The Comptroller General's Report to Congress (May 1975, Tab A to SCRAM Report) recommended that SECDEF improve contingency planning for emergency logistics support of US allies and should include as a minimum:

- A logistics management structure for emergency logistics support to allies

- An inventory of major weapon systems in the country's armed services

- Quantity and serviceable numbers of such systems in the inventory

- Level of inventory stocks normally maintained to support the system

- Loss rates projected under various combat situations

- Maintenance capability and expertise within the allies' military services

SCRAM concluded that accelerated materiel acquisition planning would logically fall within the purview of the structure defined above.

c. KE/SAI Comments

Section I-1 of AR 700-90 is quoted in part: "Industrial preparedness involves the development and maintenance of an industrial base capable of supporting approved forces in current and future military operations..." (emphasis supplied).

Section I-6 of AR 700-90 states that industrial preparedness planning is "conducted to ensure that an adequate industrial base is established, maintained and retained to be responsive to military materiel requirements in the event of an emergency..." (emphasis supplied).

These definitions imply that industrial preparedness planning is not confined solely to consideration of mobilization planning, but rather encompasses both current and future military operations, including what is termed "peacetime acceleration." The KE/SAI position is the following:

- Peacetime acceleration planning should be viewed as one aspect of industrial preparedness planning, in conformance with AR 700-90.

- Peacetime acceleration planning should be conducted by the same industrial preparedness planning organization elements that perform mobilization planning.

- Contingency planning for emergency logistics support to U.S. allies (in terms of industrial preparedness) should be integrated into the total industrial preparedness planning effort.

- Additional planning entities, if required, should be organized within the industrial preparedness function and

tasked (on a relative priority basis) to upgrade the total industrial preparedness planning effort, including both peacetime acceleration and mobilization planning.

4. State of Readiness Policy

a. RAMP-3 Comments

In January 1973, DAPPG stated that the state of readiness in the AMP will be based on present capabilities, including the current status of the TDP and the limitation created by the existence of voids in PEP's.

However, DD Form 1519's provide the basis for developing most production capability data reflected in the AMP, and current industrial preparedness planning assumes these difficulties (e.g., TDP status and PEP voids) away. Industrial preparedness planning should conform to all Department of the Army policy and guidance memoranda.

b. SCRAM Comments

An assumption of the study is that PEP utilization will be based on actual condition and location.

While present peacetime procurement planning includes war reserves to support contingencies involving U.S. forces, current policy prohibits the establishment of war reserve stocks for allied contingencies.

c. KE/SAI Comments

KE/SAI concur with both RAMP and SCRAM, in that present capabilities and limitations should be the basis for realistic planning. However, readiness planning, whether mobilization or peacetime acceleration, requires reliable input data and close interface with industry regarding the following:

- Production line requirements for planned item inventory
- Condition and location of PEP's
- Producer capabilities
- Producer readiness

Currently, DD 1519's do not provide these data to a requisite level of validity. Therefore, an audit capability is needed by the Army to acquire and assess the value of these data.

Lack of war reserve stocks for allied contingencies is an added rationale for upgrading the priority of industrial preparedness planning.

5. Planning Agreements

a. RAMP-4 Comments

Less than 80% of the items that require planning have current planning agreements. In studying a sample of 80 munitions items, RAMP identified seven with no planned producer and four for which planning was to be deleted. Significant findings that impact PEP are the following:

- Requirements fluctuate considerably.

- The industrial preparedness planning list is inaccurate, excessively long, and receives little review by higher headquarters.

- Not enough trained manpower is allocated for industrial preparedness planning.

- Delivery schedules and industrial preparedness measures listed in DD 1519's are not analyzed in sufficient depth to do meaningful planning. Such analysis should include a realistic appraisal of data validity.

b. SCRAM Comments

- SCRAM planning tends to address symptoms rather than causes of material acquisition difficulties.

- Planning data received from major subordinate command and program managers' offices varied from good to poor in quantity and accuracy.

- Major subordinate command and program managers' offices' planning reflected a need for more in-depth effort, which

requires establishment of a formal interface with industry. Authority to award service contracts for developing industrial preparedness plans is contained in ASPR 1-2206 (c) and (d).

c. KE/SAI Comments

The scope of this study does not include the requirements area; i.e., the industrial preparedness planning list. However, overall readiness is enhanced by performing adequate industrial preparedness planning for fewer items rather than incomplete planning for many.

KE/SAI concur with findings regarding the general inaccuracy of planning data and the need for more in-depth planning. Comments under the foregoing Subsections 2, 3, and 4 are applicable also to this subject.

6. Personnel Assigned to Industrial Preparedness Planning

a. RAMP-5 Comments

Industrial preparedness planning lacks sufficient personnel in terms of numbers and experience to perform competently the planning functions directed by DOD and DA. If qualified personnel cannot be made available, the number of items managed must be reduced.

b. SCRAM Comments

A full time planning entity is required at HQ AMC to fill the void between peacetime acceleration planning and industrial preparedness planning.

c. KE/SAI Comments

A review of the adequacy and competence of industrial preparedness planning staffing is outside the scope of Task B-9. As previously noted in Subsection 3, KE/SAI recommend that peacetime acceleration planning be conducted by the organizational elements that perform mobilization planning, rather than creating a separate planning function.

7. Industrial Preparedness Planning List Priorities

a. RAMP-6 Comments

The industrial preparedness planning list (IPPL) identifies those items that require planning with industry. Present criteria for selection of these items are inadequate, and there is no system of priorities to ensure that attention would be devoted to critical items instead of those of lesser importance. The priority items should receive complete planning, as suggested in 5.c. The number of items (1683) contained in the IPPL indicates that reviewing/approving authorities should give more attention to formulation of the IPPL.

b. SCRAM Comments

Difficulty was experienced in determining the number and types of items/systems for which acceleration planning should be conducted. Item selection will require coordination with HQDA and must consider user needs.

c. KE/SAI Comments

As noted, requirements determination (i.e., the IPPL) is not addressed in this study. However, KE/SAI strongly concur with the need for setting priorities within the IPPL to ensure completed planning for critical items. IPPL priorities should be compatible with priorities assigned to the current PEP study, and hence would have a direct impact on the PEP Modernization Program recommendations for Task B-6. Priorities assigned in the IPPL should provide a primary guideline for implementing the PEP Modernization Program.

8. Evaluate Planning Requirements for all IPPL Items

a. RAMP-7 Comments

Fluctuation of mobilization requirements hinders meaningful industrial preparedness planning. Such fluctuation induces a lack of confidence in requirements computations. The feasibility of a separate, stable planning requirement for all IPPL items, on a two- or three-year cycle, should be evaluated.

b. SCRAM Comments

Although the IPPL was not specifically addressed, the following comment was made with regard to planning requirements: A combination of operational project stocks and accelerated material acquisition planning is needed to offset the impact of emergency logistics support to allies on U.S. force readiness and the logistics problem.

c. KE/SAI Comments

This is a problem symptomatic of modernization and mobilization planning which affects all producer planning; as noted, the subject of requirements is not included in the scope of this study. KE/SAI concur in the need for stability of planning requirements and, equally important, in the need for realism and accurate priority setting in determining the requirements.

AR 700-90 states, in paragraph 2-11, "The foundation of IPP is the realistic determination of mobilization production and mobilization maintenance requirements for the planning period." The World War II experience of the Army's Ordnance Department with respect to munitions requirements determination has timely application to the current problem, as indicated by the following excerpt from The U.S. Army in World War II - The Technical Services, by Hary C. Thompson and Lida Mayo (Chapter IV, "The Problem of Requirements"), Office of the Chief of Military History, Department of the Army, Washington, D.C.:

"Without computation of requirements for each of the thousands of items of equipment needed by the armed forces of the United States and its allies in World War II, scheduling of balanced production would have been impossible and the whole productive effort would have run the risk of being plunged into chaos.

"From 1940 to 1942 hard-to-manufacture munitions were generally known as 'critical' items as distinguished from 'essential' items which posed less serious production problems. For both classes, but particularly for those in the critical category, it was most desirable that requirements be established as accurately as possible and

long in advance of expected need. The fact that the objective was never wholly achieved constituted one of the most serious difficulties faced by Ordnance during World War II. On this point all Ordnance officers charged with broad procurement responsibility were agreed..."

9. ASPR Incentives For Industry

a. RAMP-8 Comments

ASPR incentives for industry may not be receiving sufficient application. Current procurement programs are a primary incentive, and they should be closely coordinated with industrial preparedness planning. RAMP recommends that:

- o The Secretary of the Army issue a policy statement strongly endorsing the need to sustain and maintain the industrial preparedness base.
- o The Assistant Secretary of the Army (Installations and Logistics) direct use of incentives to maintain and broaden the base.
- o ASA (I&L) direct coordination of procurement and industrial preparedness planning.

b. SCRAM Comments

This subject was not specifically addressed.

c. KE/SAI Comments

KE/SAI concur with RAMP. See discussions of planned producer incentives in Subsection C.2.d. and the interrelationship of peacetime procurement with mobilization response in Subsection C.1.a.

10. Industry View of Industrial Preparedness Planning

a. RAMP-9 Comments

Industrial preparedness planning is a low priority action for producers because they believe the Government gives planning a low priority. A lack of management of

mobilization planning by the Government is perceived. RAMP recommends that:

- o Increased high-level support be given to the preparedness program.

- o The Office of the Secretary of the Army extend appreciation to planned producers.

b. SCRAM Comments

This subject was not specifically addressed.

c. KE/SAI Comments

The producers' comments (in the RAMP Report) with regard to lack of base management are considered to be well taken. KE/SAI concur with the need for additional high-level support, but it should be directed toward well-defined goals for improving the industrial planning system. Recommendations contained in Subsection E.2.c. that are intended to upgrade industrial preparedness planning methodology and data will substantially improve management of the base.

11. Industrial Preparedness Measures

a. RAMP-10 Comments

Producers are not informed of the current status of industrial preparedness measures (IPM's) that are recommended on DD Form 1519's. RAMP attributes this to a shortage of personnel and flucutuating mobilization requirements.

b. SCRAM Comments

This subject was not specifically addressed.

c. KE/SAI Comments

Other factors in addition to lack of personnel that affect this situation include:

- o Depth of planning required for IPM's.
- o Lack of a viable IPM feedback system.

Headquarters personnel at DSA advised the KE/SAI team that DSA personnel in the past rarely received feedback from the procuring activity regarding action taken on IPM's. Within the past year, DSA has initiated a followup procedure (using a log of all IPM's) to correct this problem. KE/SAI recommend that a direct interface be maintained by the procuring activity (i.e., ARRCOM) with the planned producers, using a qualified audit team as outlined in Subsection E.2.c. One of the audit team's functions would be to review and follow up on outstanding IPM's.

12. Automation of Planning for Production Base Plan

a. RAMP-11 Comments

Manual preparation delimits the time available for analysis of the contents of the Production Base Plan (PBP).

Automation of the PBP should be designated as a priority effort and completion expedited.

b. SCRAM Comments

This subject was not specifically addressed.

c. KE/SAI Comments

As stated in Subsection IV.C.3.(c), industrial preparedness planning requires a relatively large, complex data bank that can accommodate wide fluctuations of both input data and model parameters. As a corollary to the data bank, an effective quick-reaction processing capability is essential. Consequently, a computer-based system to handle the large volume of data used by ARRCOM's production base management function (which includes preparation of the PBP), is recommended to enhance the capability of the presently limited staff. Section X addresses the details of this activity and proposes a phased plan for its implementation. The action directed by RAMP-11 is one facet of the data processing automation essential for effective industrial preparedness planning, and should be coordinated with the recommended computer-based system for modernizing industrial resources management.

13. Condition Coding for Industrial Plant Equipment

a. RAMP-12 Comments

Condition codes of industrial plant equipment in layaway are largely incorrect, in that sample inspections indicate that the condition of the equipment is worse than reported (e.g., only 31% actually acceptable versus a reported 76% acceptability) by the present condition coding. This situation could result in lead times in excess of those incorporated in present planning agreements. RAMP recommends:

- Modernize and upgrade PEP packages other than munitions.
- Ensure proper condition coding of industrial plant equipment.

b. SCRAM Comments

The study assumptions were based on peacetime acceleration planning using actual condition and location of PEP's.

c. KE/SAI Comments

Special teams of Government personnel have recently assessed representative inventories of PEP equipment as an associated task of the PEP Modernization Program. The results generally corroborated the findings of the RAMP study, in that 40% or more items were in poorer condition than coded on a majority of PEP's. Coding of the munitions PEP's included in the KE/SAI study is being corrected by the current program. As discussed in previous recommendations for audit teams, the problem will be to keep the condition code data on a current basis.

The SCRAM analysis assumption noted above highlights the need for current, realistic data concerning industrial plant equipment capability, especially since 50% or more of the industrial plant equipment used by many of the planned producers for the planned item production is Government-furnished equipment.

14. Industrial Preparedness Operation Funding

a. RAMP-13 Comments

Historically, funding to support maintenance of the preparedness base has been inadequate. RAMP recommends that the feasibility of transferring funding for maintenance of idle industrial facilities from operations and maintenance (O&M) funds to procurement funds to improve maintenance of the base be considered.

b. SCRAM Comments

This subject was not specifically addressed.

c. KE/SAI Comments

Army account management is outside the scope of Task B-9. However, KE/SAI concur that persistent underfinancing of the base maintenance results in a deteriorated response capability and defeats the purpose of expenditures for base modernization.

F. Survey of Former Planned Producers

Withdrawals from the industrial base, and the reasons therefor, are a matter of significance in analysis of the base associated with PEP's; accordingly, KE sent a letter of inquiry to the former planned producers. This letter (see Appendix XI.F) went to 43 recipients identified with PEP's designated in X facility status in recent years.

Of the 43 letters mailed, 12 were returned as non-deliverable with the following Postal Service notations:

- Out of business
- Address unknown
- No forwarding address

Five recipients responded and from 26 there was no response.

The 12 returned letters (28% of those sent), while a rather large portion of the set, is not necessarily indicative of financial stability problems. A number of the firms addressed were subsidiaries of larger, still existent, corporations.

Although each of the 26 non-respondents may have had unique reasons for reticence, it is suggested, speculatively, that disinclination to go on record with a third party as to the circumstances of the withdrawal may have been a motivating factor.

The five responses received were not a sufficient quantity to lend statistical significance to any conclusions that might be drawn, nor were the tenor of the responses adequate to impute any pattern of conditions to the respondents' withdrawal. It is sufficient to note that the reasons given were related in substance to particular problems discussed in the preceding text of this section.

Typically, the query elicited such comments as (two or more respondents):

- Obsolete PEP equipment

- Incompatible with current employee skills

- Low-profit operation

One producer emphasized "red-tape" and excessive demand for key personnel attention.

Two producers still hold non-Army PEP's.

VI. INDUSTRIAL PLANT EQUIPMENT (IPE)

A. GENERAL

Industrial plant equipment (IPE) is the nucleus of the plant equipment packages (PEP's). As noted in Section IV, IPE is the only element of the PEP's in the DIPEC inventory.

AR 700-90 defines IPE as follows:

> "Industrial plant equipment (IPE) - Plant equipment with an acquisition cost of $1,000 or more used for the purpose of cutting, abrading, grinding, shaping, forming, joining, testing, measuring, heating, treating, or otherwise altering the physical, electrical, or chemical properties of materials, components, or end items, entailed in manufacturing, maintenance, supply processing, assembly, or research and development operations."

Not included in this definition are: (a) IPE having less than $1,000 original cost; (b) special tooling (ST); (c) special test equipment (STE), and; (d) items of other plant equipment (OPE) such as material handling equipment.

The IPE assigned to a plant layout essentially determine the manufacturing process as well as the plant's capacity for producing planned items or components. The status of the IPE (active or inactive), its condition, its current location relative to the planned item production line (in storage or otherwise), and its state of modernization all impact, to a significant degree, the mobilization responsiveness of each production line.

Industrial plant equipment (IPE) is addressed in this section, with particular emphasis on the PEP's considered in this study. Subsection B discusses the key role of machine tool IPE before World War II mobilization, with respect to munitions production planning. Current data are also presented, showing the latest IPE and PEP inventories as of mid-1976. Statistical data from a DIPEC printout are presented in Subsection C with significant details of IPE contained in the PEP's addressed in this study. Modes of equipment retention (i.e., warm and cold base) in terms of mobilization response capability are defined and discussed in Subsection D. Subsection E outlines a proposed approach for analyzing PEP IPE,

using a matrix technique to determine the optimum practicable distribution of resources to meet requirements.

B. U.S. ARMY INDUSTRIAL PLANT EQUIPMENT, HISTORICAL AND CURRENT

1. Historical

"The U.S. Army in World War II," published by the Office of the Chief of Military History, contains numerous references to the impact of machine tool availability on munitions planning and production. The key role of machine tool IPE in the World War II munitions program can be highlighted by presenting three excerpts. In the volume titled The Ordnance Department: Planning Munitions for War, Major General James H. Burns was quoted in September 1940 (on page 76):

> "The creation of additional production capacity to meet the desired (munitions) program is controlled primarily by the available production of machine tools. The output of machine tool analysis shows demand of the United States and Great Britain about twice the present yearly supply."

In discussing mobilization planning for munitions production by the Ordnance Department in the late 1930's, page 56 contains this statement:

> "Special mention must be made of the machine tool surveys. Though neither the Ordnance districts nor the office, Chief of Ordnance, conducted these alone, their participation was of importance. The over-all studies were the responsibility of the Assistant Secretary of War; the Army and Navy Munitions Board also played a part. The urgency of having an adequate supply of machine tools suitable for munitions manufacture was well understood, but the problems involved were as complex as they were vital. The industry was always relatively small and except in boom periods operated below capacity. From the mid-thirties on, through a special committee of the National Machine Tool Builders Association, the industry cooperated with the government in an effort to forestall the shortages a national emergency might bring. The questions were: What did the armed forces require? and then, Could the industry meet the requirements? In a computation of Army machine-tool requirements prepared in 1937, the needs of the Ordnance Department comprised a big

> percentage of the total. Out of 20,613 lathes needed for the whole Army, Ordnance required 16,220. In spite of efforts to anticipate these needs, 1939 and 1940 found machine-tool supply the principal bottleneck in the rearmament program. Indeed, to stretch the supply early in 1940 it became necessary to resurrect obsolete or incomplete machine tools from arsenal storehouses.

The importance of machine tools in munitions production is further highlighted by the fact that the U.S. Army Ordnance Department in World War II was more concerned with machine tools than was any other service. Consequently, throughout the war, all foreign requests for machine tools went through the Ordnance Department War Aid Section.

2. Current

Table VI-1 presents current Army-owned IPE in terms of total Army and total inventories. The DARCOM inventory is further divided by assignment to each commodity command. These inventories are categorized by numbers of active/inactive equipment items and acquisition value expressed in millions of dollars. The number of Army-owned IPE items totals about 114,000, with an original acquisition value of about $1.3 billion. DARCOM is assigned almost 90% of all Army IPE, and ARRCOM controls about 56,000 pieces of equipment, which is the largest equipment allocation to any of the commodity commands. This allocation represents about 55% of all DARCOM IPE and almost half of the total Army inventory. Table VI-2, "Inflation Factors for Adjusting IPE Acquisition Price," presents the estimated impact of inflation on cost of representative types of IPE since 1940. Assuming an average equipment vintage of circa 1955, the inflation factor is shown to be 3.0. Applying this factor to the $1.3 billion of Army-owned IPE results in an adjusted acquisition value of $3.9 billion, based on current dollars.

In the light of the World War II mobilization experience, it is apparent that this substantial machine tool inventory constitutes a valuable national resource and is, furthermore, a key element in U.S. current and mobilization defense production capability.

Table VI-3, "PEP Package Status as of June 1976," presents the latest available inventory from the Defense Supply Agency of all PEP's in the Department of Defense. The Army is assigned

AD-A039 561 KAISER ENGINEERS OAKLAND CALIF F/G 15/5

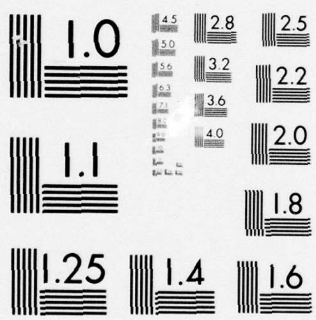
PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM. VOLUME 9. --ETC(U)

MAY 77 DAAA21-75-C-0303

UNCLASSIFIED 75-86-R-9 NL

3 OF 5

AD A039561



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

TABLE VI-1
U.S. ARMY-OWNED IPE

Command	Active Quantity	Active Cost*	Inactive Quantity	Inactive Cost*	Total Quantity	Total Cost*
Army Total	86,658	$805.3	27,230	$479.8	113,888	$1,285.1
DARCOM Total	75,047	756.1	27,105	477.3	102,152	1,233.4
ARRCOM	32,699	439.9	23,207	399.0	55,906	838.9
AVSCOM	1,082	24.3	290	8.1	1,372	32.4
ECOM	4,350	22.1	146	0.7	4,496	22.8
MICOM	7,098	56.7	2	0.1	7,100	56.8
TARCOM	3,463	56.6	3,342	67.9	6,805	124.5
TECOM	8,198	41.1	0	0	8,198	41.1
TROSCOM	284	2.3	1	0.001	285	2.3
DEPOTS	10,310	71.6	81	0.9	10,391	72.5
LABS	7,563	41.4	36	0.6	7,599	42.0

* - $ Millions

As of 30 September 1976.

Source: DARCOM (Capt. Keating), Telecon 5 January 1977.

TABLE VI-2
INFLATION FACTORS FOR ADJUSTING
IPE ACQUISITION PRICE

Year of Acquisition	Factor
1975	1.0
1974	1.1
1973	1.2
1972	1.3
1971	1.4
1970	1.5
1969	1.6
1968	1.7
1967	1.8
1966	1.9
1965	2.0
1964	2.1
1963	2.2
1962	2.3
1961	2.4
1960	2.5
1959	2.6
1958	2.7
1957	2.8
1956	2.9
1955	3.0
1954	3.1
1953	3.2
1952	3.3
1951	3.4
1950	3.5
1949	3.6
1948	3.7
1947	3.8
1946	3.9
1945	4.0
1944	4.0
1943	4 0
1942	4.0
1941	4.0
1940	4.0

TABLE VI-3
PEP STATUS AS OF
30 JUNE 1976

Assigned to	Packages	Items	Acquisition cost
Army	202	32,114	$570,575,166
Navy	31	6,049	120,682,538
Air Force	25	8,448	166,886,379
DSA	4	650	4,124,657
Totals	262	47,261	$862,268,740

Source: DSA - Industrial Resources and Preparedness Planning Division

202 PEP's out of a Defense Department total of 262 packages. The cost of the 32,000 items of IPE included in the Army PEP's is almost $600 million.

Comparison with Table VI-1 shows that close to one half of the original acquisition cost of all Army-owned IPE is charged to Army-assigned PEP's ($600/$1,200 million); however, only about 28% of the Army-owned IPE items are assigned specifically to PEP's (32,000/114,000). Applying the average inflation factor of 3.0 (from Table VI-2) results in an adjusted acquisition value of $1.8 billion for all Army PEP assigned IPE. Data furnished by DARCOM shows that as of 30 September 1976 ARRCOM had a total of 172 assigned PEP's; therefore, ARRCOM, as a single commodity command, is assigned about two-thirds of all Defense Department PEP's. This highlights the key role played by the PEP concept in munitions production planning

C. DIPEC SURVEY DATA

1. Location of Government-Owned IPE

Government-owned IPE associated with PEP's reviewed in this study totals approximately 13,000 items, of which about 35% is retained in Government central storage facilities as shown in Figure VI-1. The remaining equipment is located at the planned producers' facilities, of which 37% is PEP-assigned IPE and approximately 28% is non-PEP IPE.

Two significant conclusions are evident from these data:

- Approximately one-half of the PEP-assigned IPE is currently in Government storage.

- More than 40% of the total Government-owned IPE at the producers' plants is not PEP-assigned.

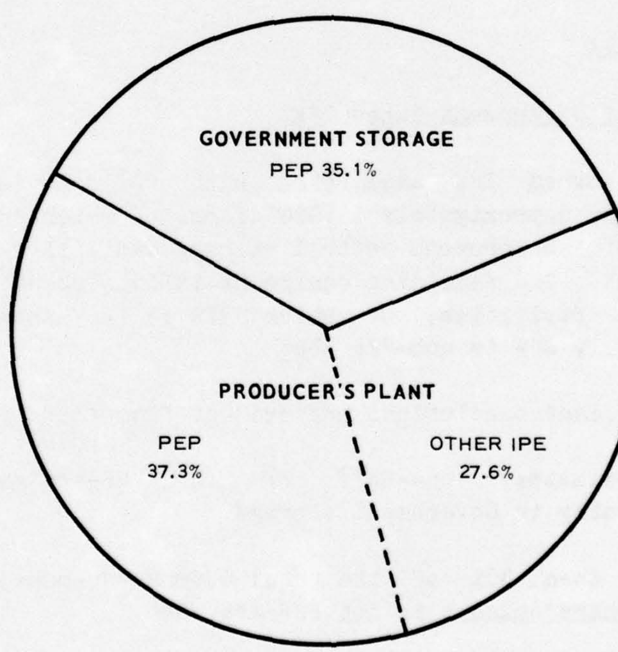
Both DODI 4215.1 and AR 700-90 specify the facility of the last producer as the preferred layaway location.

Some considerations that affect the Government's ability to achieve storage at the planned producer's site are the following:

FIGURE VI - 1

LOCATION OF IPE IN PEP's AND OTHER IPE

ARMY MUNITIONS METAL PARTS PEP's



SOURCE: LIST OF PLANTS ASSOCIATED WITH PEP's, 12/17/75

- o Lack of Government funding to reimburse producers for storage facilities, Government equipment storage, and supervision (i.e., facilities contracts)

- o Producer's desire to use plant floor space for commercial work rather than in-plant storage of idle IPE

- o Government policy not to transport equipment to planned producer's site until needed for mobilization

2. <u>Producer Activity Status</u>

Figure VI-2 depicts the distribution of IPE with respect to the status of assigned planned producer (i.e., active, inactive, X-facility). As shown, approximately 48% of the total is assigned to active producers, 26% is designated as X-facilities, and the remaining 26% is assigned to inactive producers. Therefore, slightly more than one half, or 52% of the total 13,000 pieces, of IPE is relegated to either cold base or X-facility status.

Distribution by product category is shown in Figure VI-2 as follows:

- o Fuzes, 31%

- o Small caliber ammunition, 10%

- o Other metal parts, 59%

IPE assigned to active producers may not necessarily be used for current production. Some active producers have IPE in layaway at their facilities and/or in Government storage. The producer may be currently in production on only a few of the items planned for mobilization, or the planned capacity may be greater than the current production requirements. In both instances, the excess equipment may be retained in layaway.

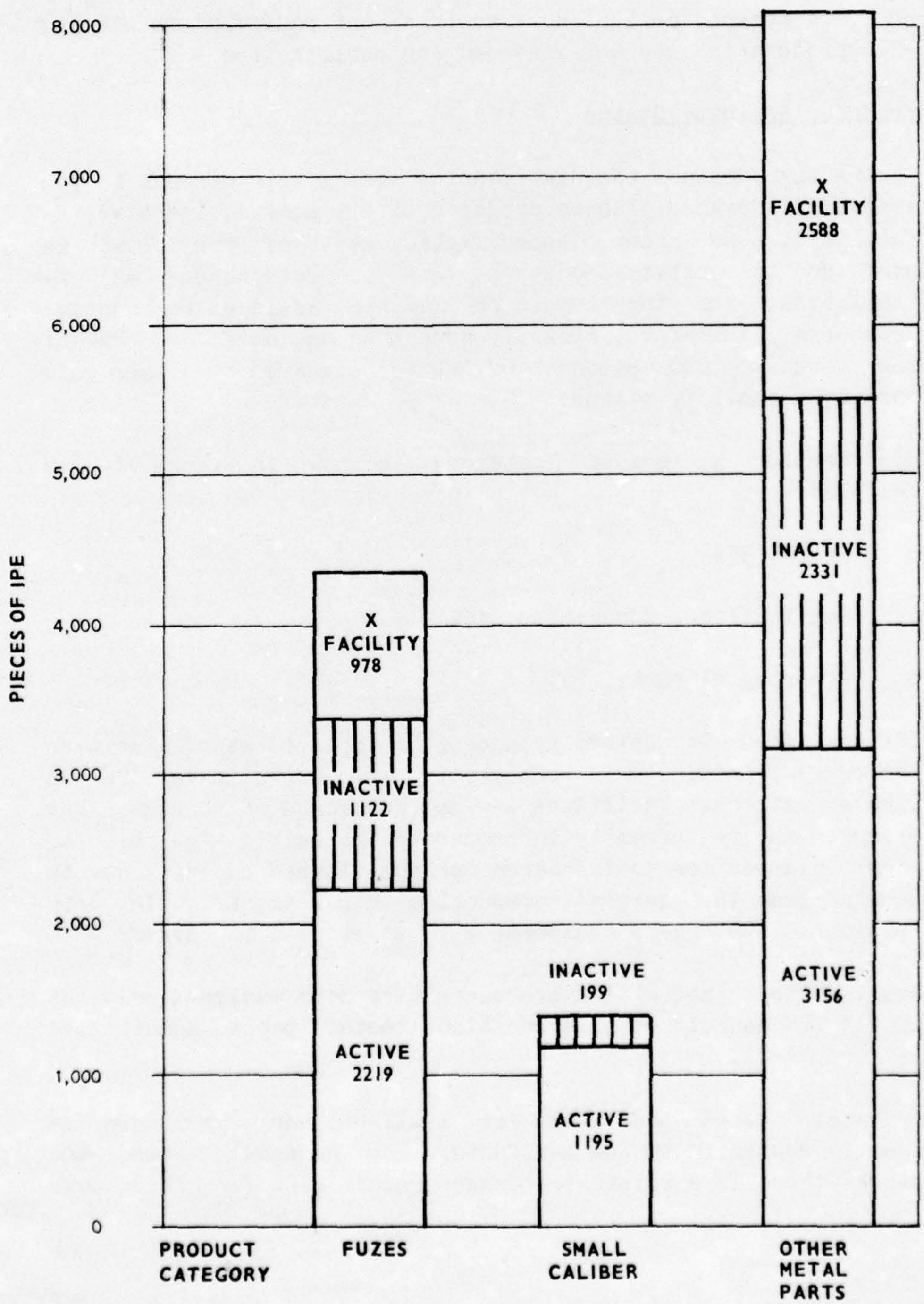
Small-caliber ammunition producers have been assigned only 10% of all IPE associated with munitions metal parts manufacture (Figure VI-2).

Privately owned IPE used for small-caliber ammunition is usually adaptable to the manufacture of consumer goods, and hence there is a relatively lesser requirement for GFE in this

FIGURE VI - 2

IPE QUANTITIES PER PRODUCER STATUS BY PRODUCT CATEGORY

ARMY MUNITIONS METAL PARTS PEP's



area. Also noteworthy is that 85% of the IPE assigned to small-caliber PEP's is located at active producer plants; no PE are listed in X-facility status. This suggests that small-caliber producers tend to retain their status as planned producers and do not withdraw from the base.

Other metal parts producers, as shown in Figure VI-2, have a total of over 8,000 items of IPE; however, only 29% of this IPE is currently assigned to active producers. Also, other metal parts producers account for about 73% of all IPE that is in X-facility status.

3. Government-Storage Locations

Government storage is located at 22 sites in 15 states, as shown in Table VI-4. Since many PEP's have IPE in more than one location, it may be worthwhile to review the feasibility of consolidating storage locations in the interest of efficient maintenance and management.

4. Operating Status

Figure VI-3 depicts the following operating status codes of PEP-assigned IPE:

Code 1. IPE that is active, reserved, or on loan, 38%

Code 2. IPE in transit or to be forwarded, 0.5%

Code 3. IPE in departmental reserve awaiting issue, in PEP storage, or used intermittently, 60%

Code 4. Idle IPE in general reserve, IPE being held for approval to sell, or IPE held while planning use is developed, (none)

Code 5. Disposal or removal from inventory, 0.7%

As shown under Code 3, 25% of the total PEP-assigned IPE is stored at producers' plants.

TABLE VI-4
GOVERNMENT STORAGE LOCATIONS FOR IPE FROM PEP'S
ARMY MUNITIONS METAL PARTS

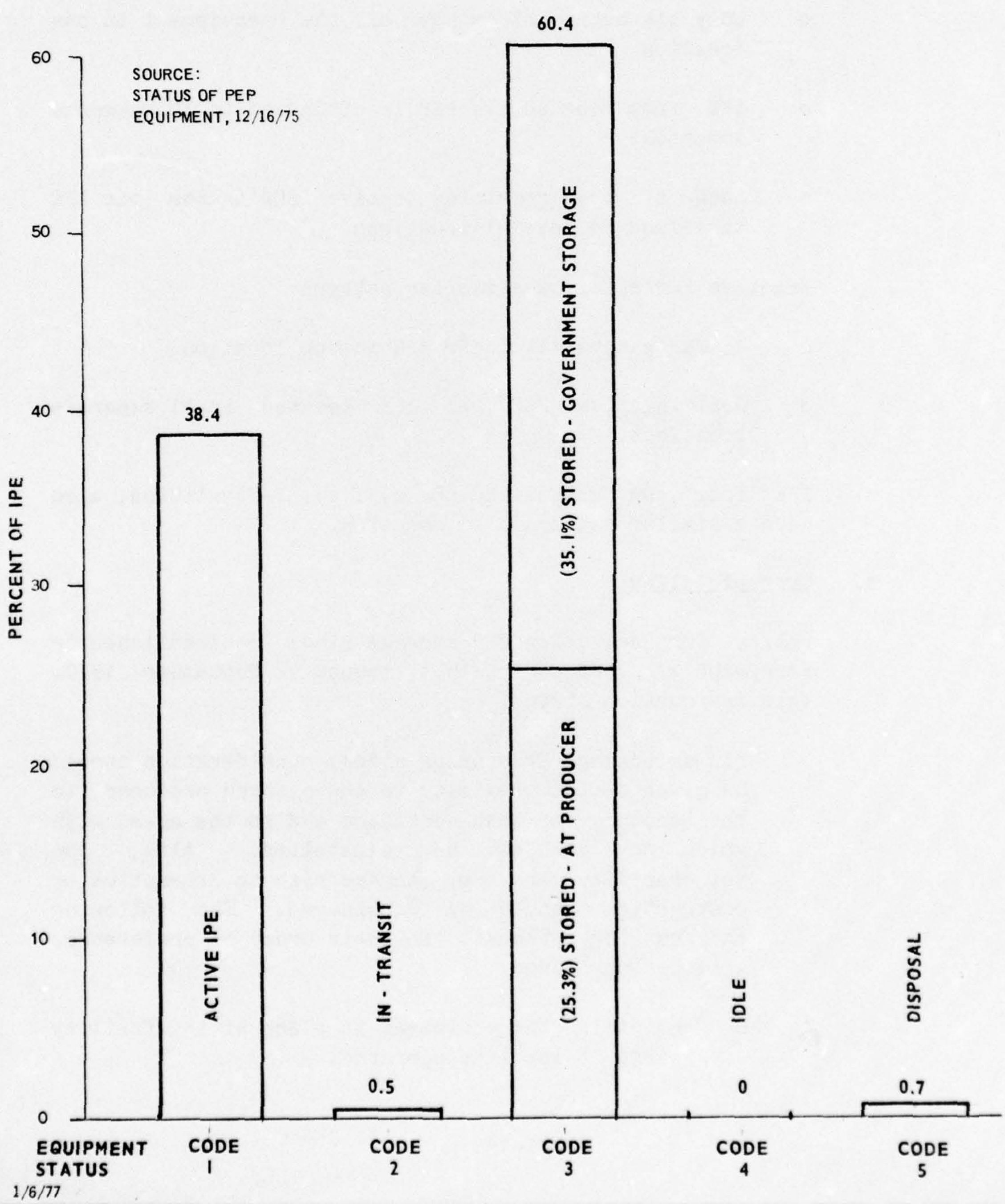
State	Storage Location	No. of PEP's	Pieces of IPE
Alabama	Anniston Army Depot	1	2
Arkansas	Pine Bluff Arsenal	1	1
California	Tracy Def Depot	36	151
Illinois	Joliet AAP	9	283
Indiana	Navy Wep Spt Ctr	4	4
Indiana	Newport AAP	3	59
Iowa	Iowa AAP	10	68
Kansas	Atchison DIPEF	49	636
Kansas	Kansas AAP	4	9
Kansas	Page Airways, DIPEF	3	4
Maryland	Edgewood Arsenal	3	13
Michigan	Pontiac Storage Fac	33	327
Minnesota	Donovan TCAAP	2	2
Minnesota	Twin Cities AAP	5	85
Missouri	Lake City AAP	1	3
New York	Seneca Army Dep	44	1,186
Ohio	Def Const Sup Ctr	42	321
Ohio	Ravenna AAP	29	1,062
Pennsylvania	Mechanicsburg, Def Depot	42	521
Pennsylvania	Scranton AAP	1	1
Pennsylvania	Letterkenny A Depot	1	2
Utah	Ogden Def Depot	1	1
			4,741

Source: Count of industrial plant equipment by state for related PEP's - 1/8/76.

FIGURE VI - 3

INDUSTRIAL PLANT EQUIPMENT STATUS

ARMY MUNITIONS METAL PARTS PEP's



1/6/77

5. IPE Dispersal

a. Pattern

As previously noted, the term "active PEP producer" does not necessarily mean that all IPE from an active PEP is active or even located at the producer's plant. Figure VI-4 indicates the following:

- Only six active PEP's have all their equipment in one location.

- IPE from one active PEP is dispersed in 10 separate locations.

- Each of the remaining active PEP's has its IPE dispersed in several locations.

Inactive PEP's follow a similar pattern:

- 13 PEP's have all their IPE in one location.

- One inactive PEP has IPE located in 11 separate locations.

IPE from the unassigned PEP's, i.e., X-facilities, also have a similar pattern of dispersion.

b. Current Policy

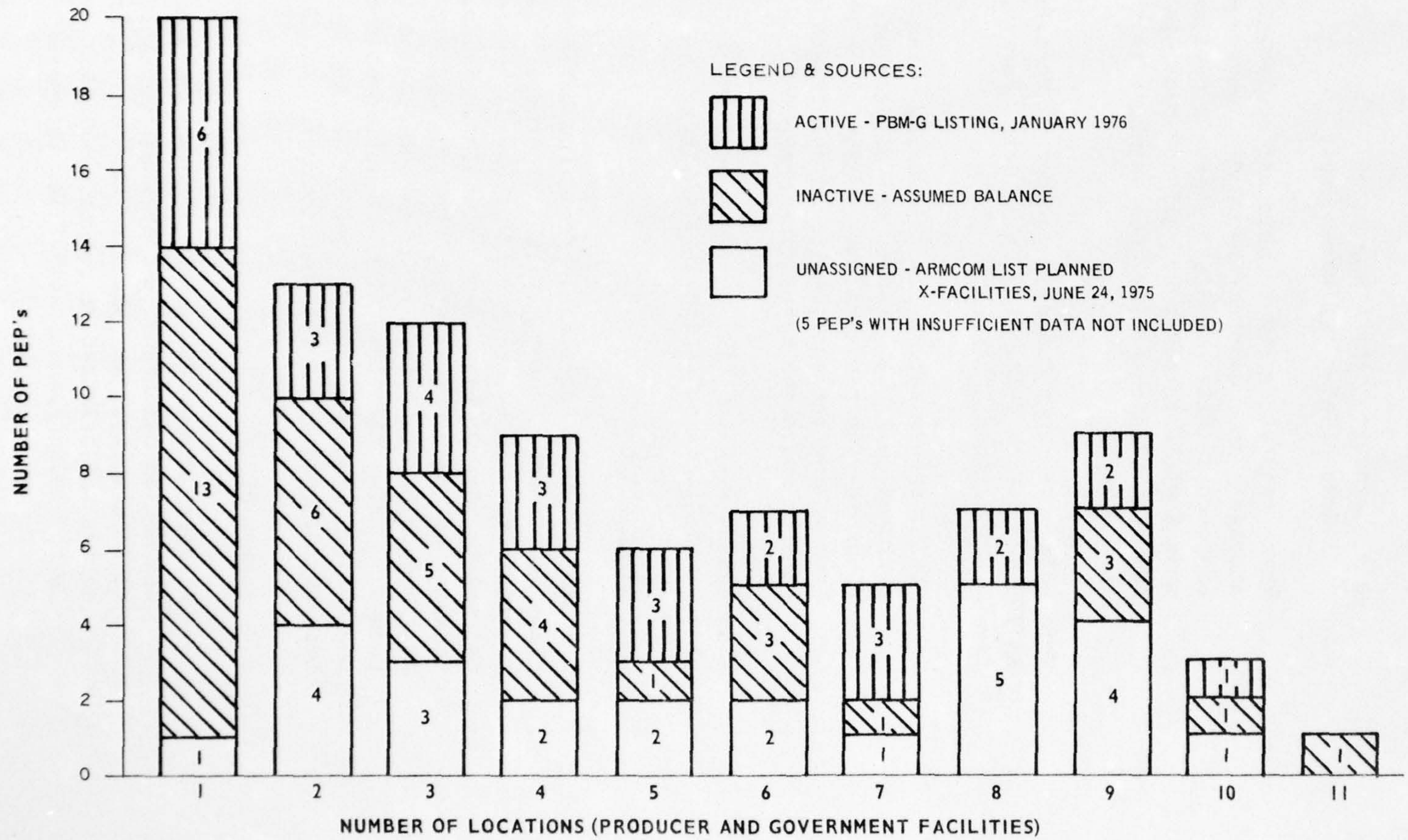
Policy for selecting PEP storage sites is established in Paragraph VI.j. of DODI 4215.1, issued 22 September 1972. This instruction states,

> "In selecting PEP storage sites, consideration should be given to the proximity to the planned producer, to the economy of transportation and to the speed with which the PEP can be reinstalled. Also, the vulnerability of the storage site to disruption or destruction should be considered. The following choices for storage, in their order of preference, will be considered:
>
> - Maintain the equipment in place at the facility where it was last operated.

FIGURE VI - 4

DISPERSION OF STORED IPE BY PEP's

ARMY MUNITIONS METAL PARTS PEP's



- Hold the equipment on-site or adjacent to point of last use.

- Maintain the equipment in DOD or other Government-owned warehouses.

When requesting DSA to ship PEP equipment to central storage in Government-owned warehouses, DOD components will indicate that a decision has been made that it is not practical nor feasible to store the equipment on-site nor adjacent to the point of last use."

This policy is taken one step further in Paragraph 5-9b of AR 700-90, issued 4 August 1975. This Paragraph covers layaway of PEP's and states:

> "The determination for locating plant equipment packages will be based on dispersion, the time required for reactivation, losses which could result from moving the equipment, and comparison of costs of on-site and other types of storage."

Although dispersion is a consideration in both these directives, it is not a specific criterion in DODI 4215.1.

c. <u>Current Practice</u>

Discussions with personnel from the Defense Industrial Plant Equipment Center (DIPEC) indicate that, where practicable, PEP's are stored at the Government facility nearest to the current planned producer. Exceptions occur because of size or facility handling capabilities. IPE assigned to PEP's to fill voids is not removed until it is needed. This practice, although not in conformance with DODI 4215.1 as quoted above, appears to be in the best interest of good mobilization planning.

- <u>Active PEP's</u>

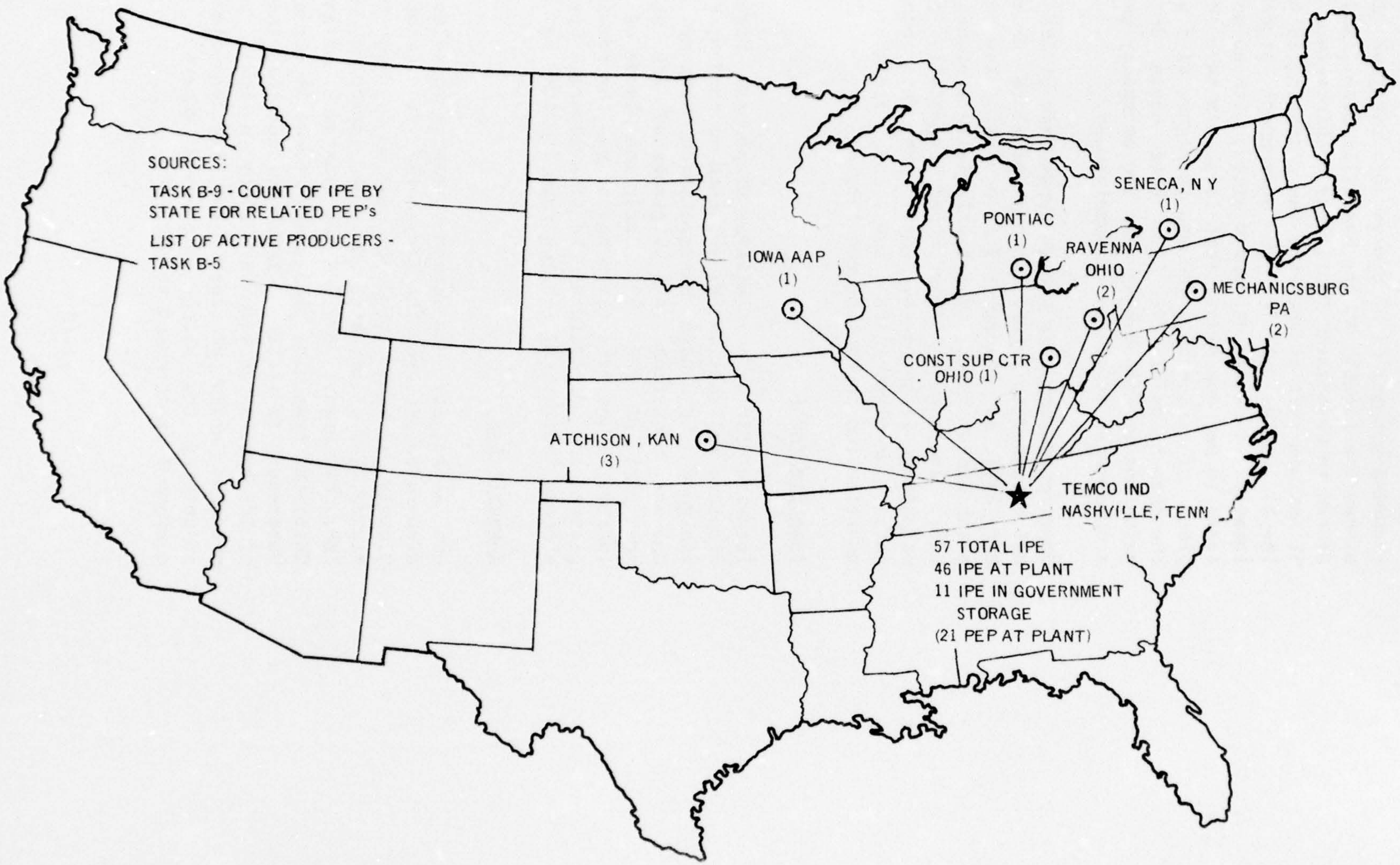
  Although dispersion is not a policy objective, actual dispersion has resulted from Army practices. Figure VI-5 displays an example of the dispersion of an active PEP selected at random -- PEP 227, assigned to Temco Industries of Nashville, Tennessee. Temco has

FIGURE VI - 5

EXAMPLE - IPE LOCATION - ACTIVE PEP

(PEP 227, TEMCO INDUSTRIES, NASHVILLE, TENN)

ARMY MUNITIONS METAL PARTS PEP's



recorded a total of 57 pieces of assigned IPE; 46 pieces are located at the Nashville plant, and 11 are stored in Government facilities. Thirty-two of the 57 IPE are part of the PEP; the remaining 25 are not. The 11 pieces of IPE in Government storage are located at seven different sites, with no more than three in any one place; four locations have only one piece of IPE each. The map in Figure VI-5 portrays the dispersion of PEP 227; this could delay the gathering of stored equipment for emergency use, with a consequent effect on responsiveness.

Some producers have a high percentage of IPE that is not assigned to a PEP. In the previous example of PEP 227, 25 pieces of IPE, or 45% of the total in-plant IPE at Temco, is not officially assigned to PEP 227. Assessment of producer capability by base management is hampered, when firm data concerning total in-plant IPE and its assignment for mobilization production are lacking.

o <u>Inactive PEP's</u>

Inactive PEP's are similarly dispersed. Figure VI-6 displays an inactive PEP selected at random; PEP 167, assigned to Rheem Manufacturing Company of New Orleans, Louisiana. All 75 pieces of IPE at Rheem are part of PEP 167. Sixty-one pieces of IPE are located at the producer's plant, and the remaining 14 pieces are distributed to five separate Government storage facilities, ranging from New York to Kansas.

o <u>X-Facilities</u>

One X-facility was chosen at random to illustrate a dispersion pattern, the former PEP 221, whose previously assigned producer was G. D. Roper Company. Figure VI-7 illustrates the wide dispersion of this PEP; 86 pieces of IPE are located at Ravenna AAP, Ohio; the remaining pieces are stored at eight other Government facilities. It is evident that inspection of IPE associated with PEP 221 by a newly assigned producer would be costly and time consuming, as is inspecting the widely dispersed general reserve equipment being added to any PEP.

FIGURE VI - 6

EXAMPLE - IPE LOCATION - INACTIVE PEP
(PEP 167, RHEEM MFG CO, NEW ORLEANS, LA)
ARMY MUNITIONS METAL PARTS PEP's

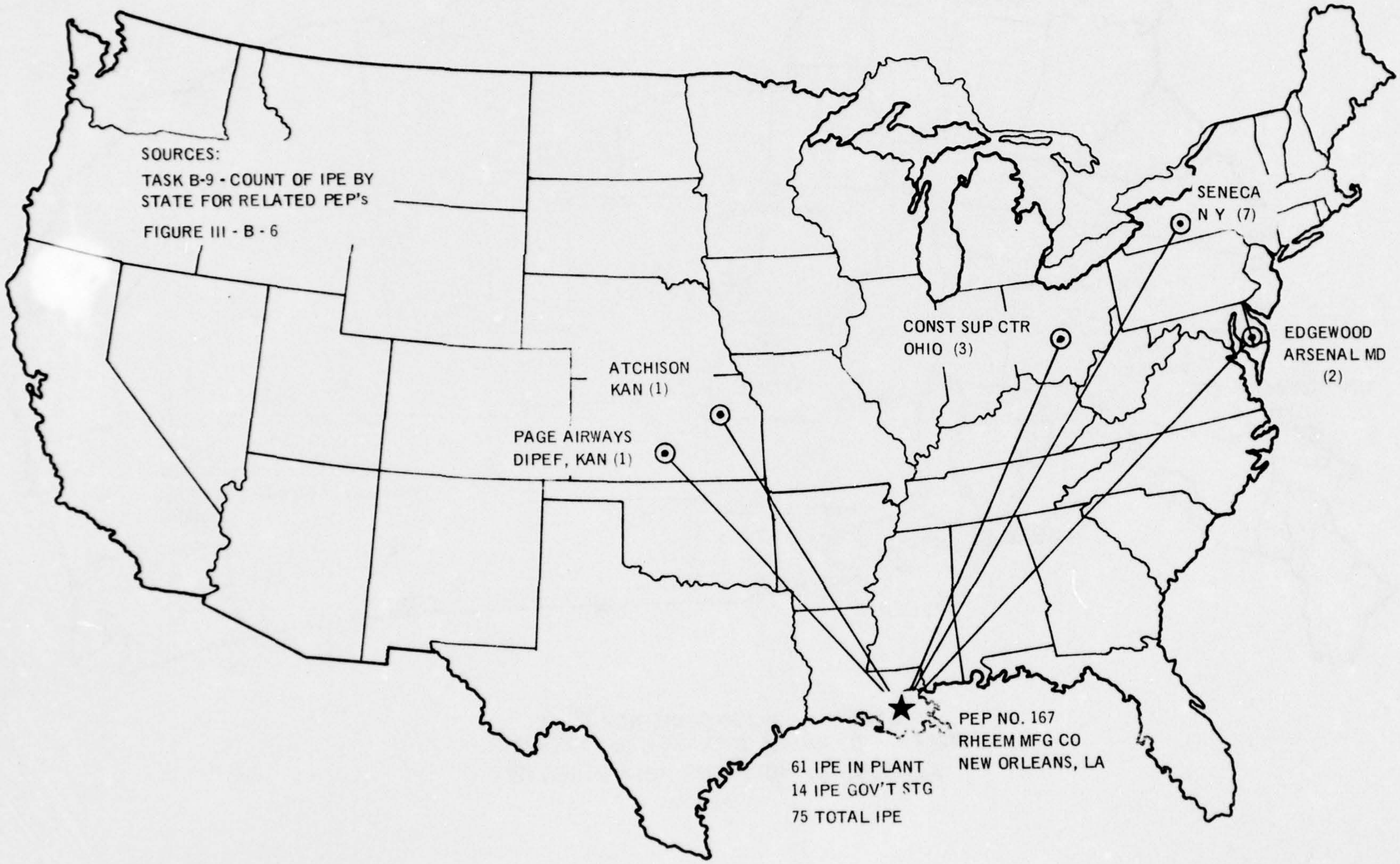
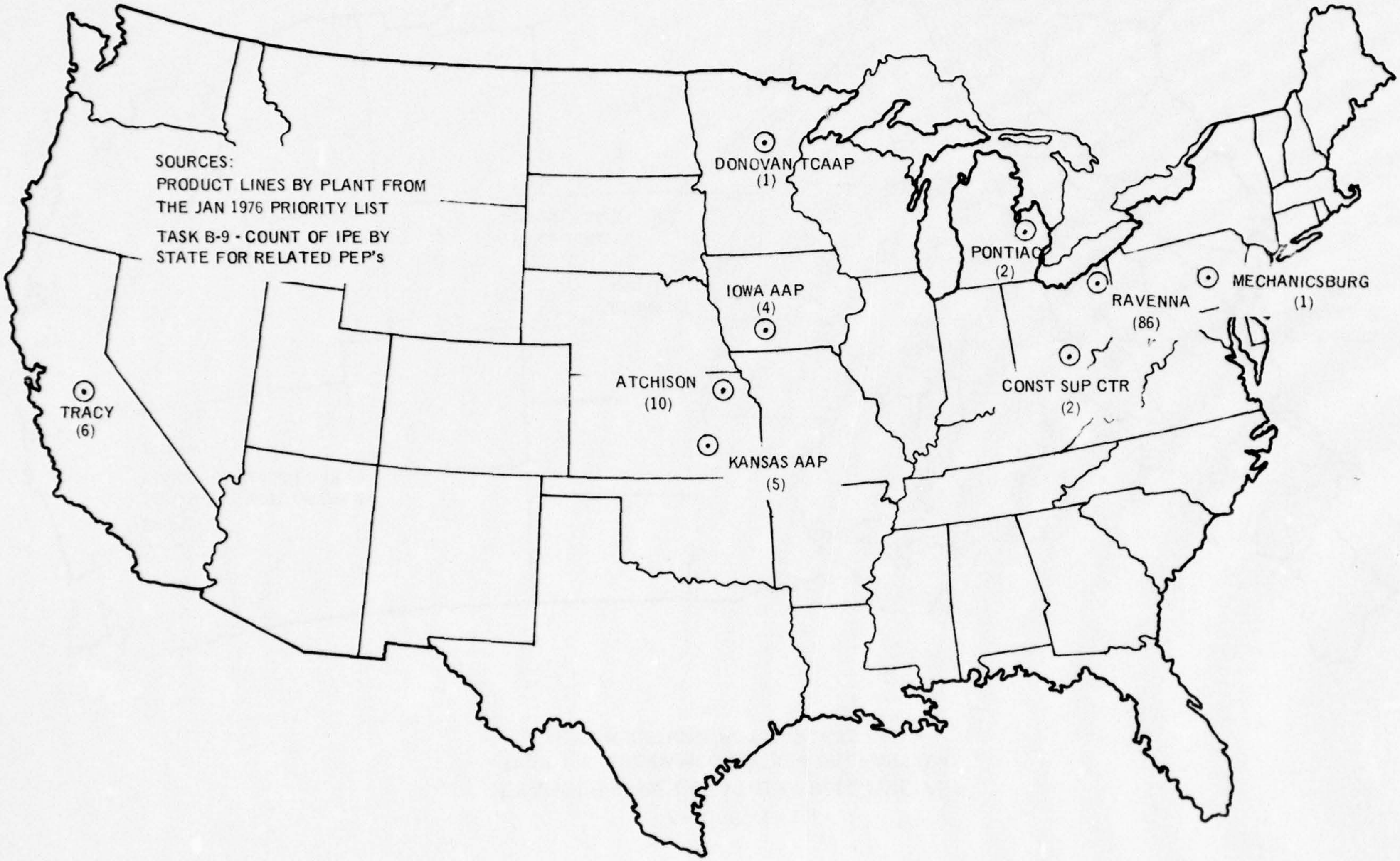


FIGURE VI - 7

EXAMPLE - IPE LOCATION - X FACILITY

(FORMERLY PEP 221, G. D. ROPER CO. - 112 IPE)

ARMY MUNITIONS METAL PARTS PEP's



6. Quantities of IPE by Type

IPE from PEP's for munitions metal parts were categorized into nine equipment types by plant equipment code (PEC) numbers to determine their respective quantities. Figure VI-8 presents these data, with the location for each type and number of items at each location. As shown, turning and boring is the largest category, approximately 36% of the total; presses constitute the second largest category with 13% of the total.

The "special machines and miscellaneous" category, comprising 21% of the total inventory, includes all IPE not assigned to the other eight types. The term "special machines" includes standard IPE adapted for special purposes to perform operations not possible with standard equipment. Significantly, over half of the special machines and miscellaneous types are stored at Government facilities. Each machine in the special-purpose design category should be reviewed individually to determine whether it should be retained or be replaced with standard equipment. The benefits of reducing the inventory of this special-purpose equipment would include savings in storage, maintenance, and management costs. Also apparent from Figure VI-8 are the relatively large quantities of IPE of each machine type not assigned to a PEP, which nevertheless may be used by the planned producers; for some equipment types, it constitutes approximately a third of the total inventory.

This substantial inventory of non-PEP IPE should also be subject to planned item assignment by mobilization planners; otherwise, a true reflection of the producer's capability may not be included in the data base.

7. Condition Coding

Figure VI-9 displays the quantities of IPE reported by DIPEC, as described by each of four basic condition codes (as established in Appendix 1C, DSAM 5215.1/AR 700-43):

- N - New
- E - Used, reconditioned
- O - Used, usable without repairs
- R - Used, repairs required

Each code is subdivided into four numerical classifications for further condition qualification, with condition 1 denoting the

FIGURE VI - 8

QUANTITIES OF IPE BY TYPE

ARMY MUNITIONS METAL PARTS PEP's

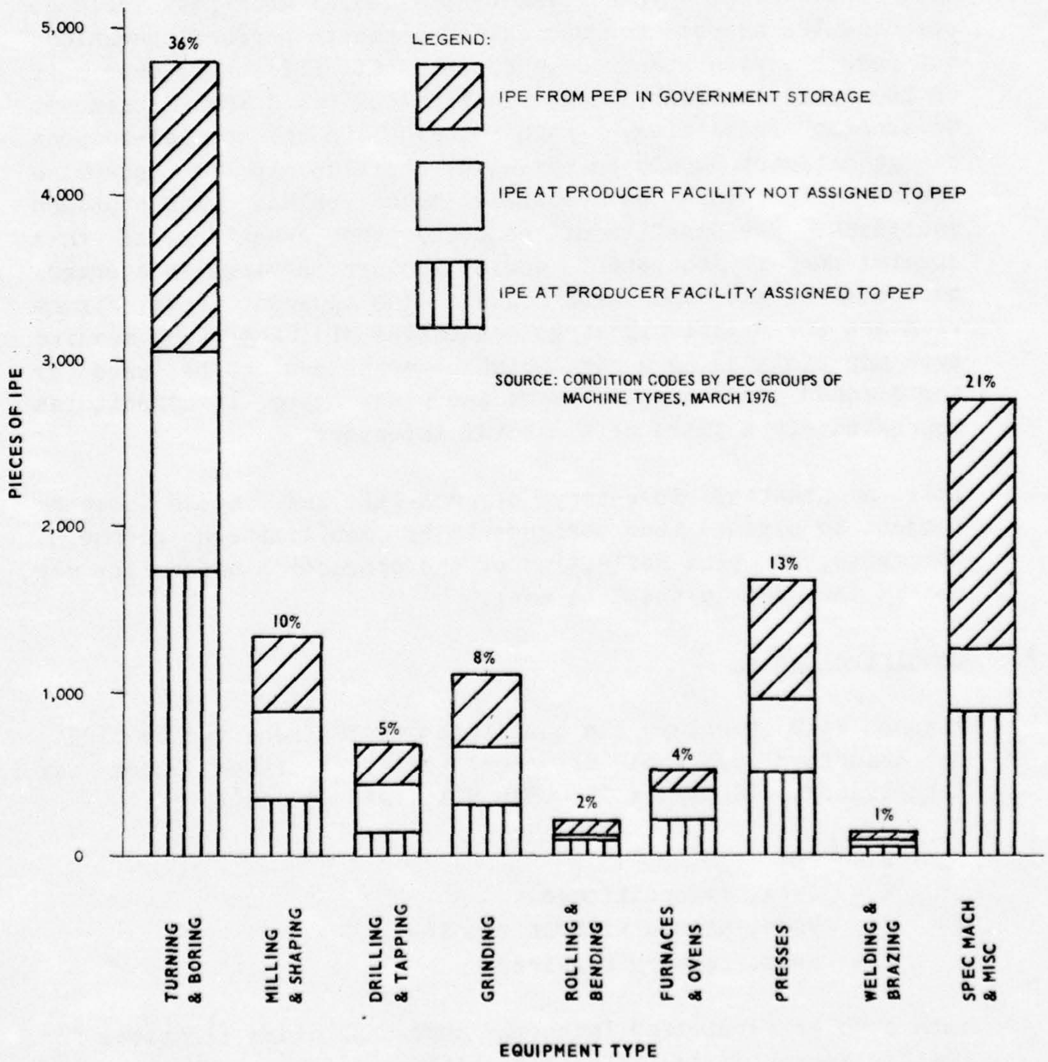
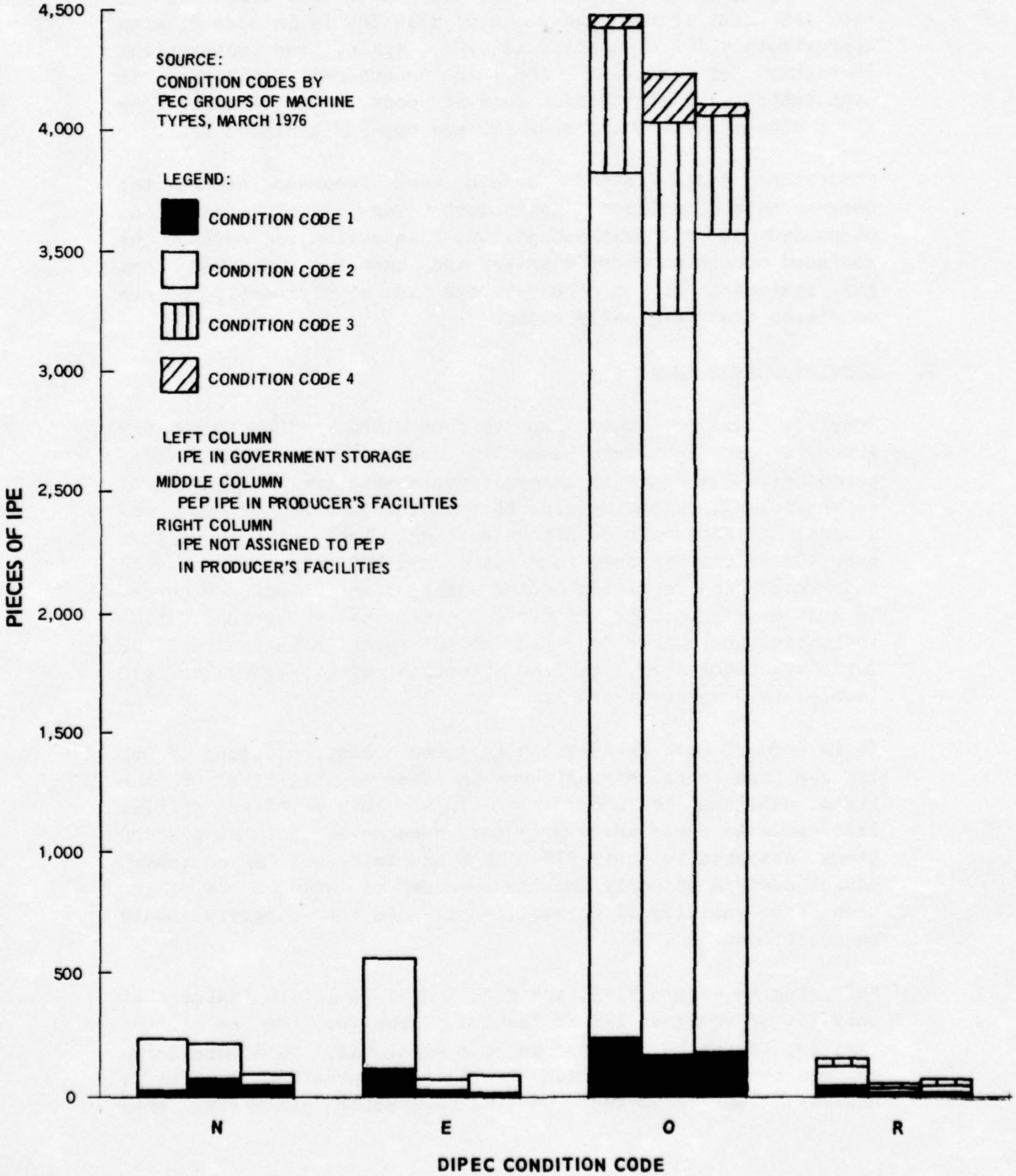


FIGURE VI - 9

DIPEC CONDITION CODE FOR IPE

ARMY MUNITIONS METAL PARTS PEP's



best and condition 4 the poorest. In Figure VI-9, the N and E codes display only conditions 1 and 2; no conditions 3 and 4 were recorded. The R code indicates only three conditions (i.e., 1, 2, and 3). Codes N, E, and R have less than 10% of the IPE distributed among them; most IPE is in code 0, with approximately 70% classified as 0-2. Again, the substantial inventory of non-PEP IPE in producers' facilities is highlighted; the righthand column of code 0 in Figure VI-9 shows almost equal numbers of PEP and non-PEP assigned IPE.

Condition codes cited herein were recorded before the Government's Condition Assessment Team evaluation. As discussed in the next subsection, this evaluation revised the assigned condition codes downward and thereby indicated that PEP equipment is on the average in significantly poorer condition than originally coded.

8. <u>Condition Assessment</u>

Special teams of machine experts from DIPEC, ARRCOM, Picatinny Arsenal, and Frankford Arsenal, assisted by local DCAS personnel, have recently assessed representative inventories of PEP equipment, producing reports that indicate significant instances of inaccurate condition ratings. Table VI-5 shows that over 40% of the IPE from four out of six PEP's assessed on-site had inaccurate condition coding assigned on the DIPEC records. In most cases, the IPE condition code was downgraded, thus indicating the poorer condition of IPE as shown in Figure VI-9. Table VI-6 indicates a similar situation with regard to IPE located in Government storage.

It is evident that erroneously assigned condition coding of PEP IPE can lead to false confidence in the capabilities of the PEP's assigned to production lines. This point has special importance in cases where producers have never made the planned items assigned to their PEP. When the laid away PEP equipment cannot perform properly and the producer is unaware of this, then the validity of an assigned planned item capacity should be questioned.

Referring to Figure VI-3, the Code 1 designation indicates that only 38% of assigned IPE is "active, reserved, or on loan"; that is, it can be inferred to be operational. This conclusion assumes that all IPE in Code 1 is in good operating condition; however, as remarked in the preceding paragraph, this

TABLE VI-5
CONDITION ASSESSMENT OF PEP IPE
AT PRODUCER PLANTS
ARMY MUNITIONS METAL PARTS

Percentage By PEP

PEP No.	Confirmed	Upgraded	Downgraded
83	83	3	14
95	48	1	51
98	50	0	50
200	41	18	41
570	75	13	13
620	45	10	45

Source: Page V-385, Volume 1, Condition Assessment Procedures Evaluation, Plant Equipment Package Modernization Program

TABLE VI-6
CONDITION ASSESSMENT OF PEP IPE
AT PRODUCER PLANTS
ARMY MUNITIONS METAL PARTS

Percentage By Location

Location	Confirmed	Upgraded	Downgraded
Atchison	38	4	58
Columbus	75	0	25
Mechanicsburg	81	5	14
Seneca	40	2	58
Tracy	73	18	9

Source: Page V-386, Volume 1, Condition Assessment Procedures Evaluation, Plant Equipment Package Modernization Program

assumption is not valid because the equipment is generally in poorer condition than the condition code indicates. Therefore, the capability of the currently active IPE (which constitutes 38% of the total inventory) in terms of mobilization production is questionable.

The effects of erroneous condition ratings are compounded by the fact that many of the planned producers use more than 50% Government-owned equipment for the IPE used in producing munitions metal parts. Some planned producers use up to 100% Government-owned IPE. As previously noted, of the first 14 producers visited by KE/SAI teams, seven had PEP's with over 90% Government-owned IPE, with two of these seven having 100%.

It is emphasized that these comments apply only to Government-owned equipment. Condition of the producer-owned equipment, which is integral to the production capability being retained in a PEP, is no less important, but this equipment has not been assessed except in part in the current PEP Modernization Program.

The conclusions are:

- o The Government does not presently have adequate data to determine the condition of all significant items of equipment.
- o A recent sampling of PEP equipment indicates that, in some instances, more than 40% of IPE is in poorer condition than records indicate.
- o An accurate updating of equipment condition records should be a priority data collection task.
- o Validations should be made of assigned planned item capacities for those planned producers who have not had PEP modernization analyses performed for their respective production lines.

9. <u>IPE Retention and Assignment</u>

As shown in Figure VI-1, approximately 28% of the total Government IPE is located in producers' plants as non-PEP IPE (i.e., not assigned to a PEP). It may be held for several purposes, including the following:

- Planned for use in connection with a PEP

- Currently in an idle status with potential for future or mobilization requirements

- In use on current procurement

In any case, a significant amount of IPE is outside of the strictly PEP-assigned inventory. The distribution of this special category of non-PEP IPE is shown by PEP producer in Section V, Table V-1, as the difference between total IPE quantity and PEP IPE (i.e., column 5 minus column 4).

Therefore, determination of the adequacy of, or redundancy in, the current inventory of Government-owned IPE requires validation of both PEP-assigned and non-PEP IPE. Appropriate follow-on action to acquire needed replacement or modernized equipment from DODIER or elsewhere should be based on validation analyses of each producer's lines. An analysis (applied to metal parts PEP-assigned equipment only) is currently being accomplished under Task B-5 of the PEP Modernization Program for a limited number of planned producers. It is recommended as an ongoing task that <u>all</u> approved IPE in the private sector (that is, PEP-assigned IPE and non-PEP IPE assigned to active producers, inactive producers, and X-facilities) be screened and qualified for continued retention and possible reassignment in the mobilization base. Subsection D. discusses modes of equipment retention and Subsection E. outlines a recommended methodology for IPE retention and assignment decisions.

D. RETENTION MODES

1. General

Planned item production lines were defined in Section IV, which did not address the mode of equipment retention; i.e., hot, warm, or cold base. Selection of a given mode is dependent on the response time desired to achieve startup and full production of a planned item.

Satisfactory startup requires that the producer must have produced an acceptable first article that successfully meets first article inspection and proving ground tests for performance before initial production is authorized.

Slightly varying definitions of equipment retention modes are contained in AR 700-90, dated 4 August 1975, and the Procurement Planning and Policy Guidance (PPPG) document of the Department of the Army, dated 1 December 1975. These definitions are presented and the ascribed features of each are discussed in the following paragraphs.

2. Definitions

a. Minimum Sustaining Rate (MSR)

The minimum sustaining rate is that rate required to produce an item on a single-shift basis without increasing unit cost above that which would apply in maximum single-shift operations. This definition is essentially the same in both AR 700-90 and the PPPG.

b. Hot Base

AR 700-90 states that a planned producer's manufacturing facility that is currently producing or will be producing the planned item when M-day occurs is a hot base. Note that AR 700-90 also states that various degrees of a hot base may exist; production at maximum or minimum sustaining rates, production extending beyond the reorder leadtime, or to a point in time less than the reorder leadtime. PPPG does not define a hot base.

c. Warm Base

PPPG states that a warm base is a facility producing on M-day at the minimum sustaining rate. AR 700-90 does not specifically define a warm base.

d. Cold Base

PPPG states that a cold base is one wherein no facility is producing on M-day. AR 700-90 gives a slightly different definition, that a cold base is a planned producer's manufacturing facility that is not currently producing and/or is not scheduled to be producing the planned item on M-day.

3. Discussion

a. Hot Base

The term hot base could be confusing, because it is not defined explicitly in terms of production rate, which would distinguish it from a warm base. It is recommended that this ambiguity be clarified.

A hot base, by definition, has achieved startup; therefore, expanded production is attained by extending and adding work shifts as ancillary equipment, such as tools, jigs, and fixtures, becomes available. Producer interest during peace time is high with a hot base, because there is current production.

b. Cold Base

Experience during the Southeast Asia conflict has shown that a cold base will generally require a minimum of 12 months for startup, and, in most cases, startup within 12 months will not be achieved from a cold base. If the planned producer has not been designated, then the equipment is in an X-facility category; the Government-furnished equipment required is unknown until a future assignment is made to a producer.

The length of time to startup a cold base can be reduced if all required equipment and tooling is in place at the planned producer's facility, connected to power, and is exercised at regular, predetermined intervals by a cadre trained personnel. Under these circumstances, startup time could be assumed to be approximately four months, with about nine months total duration to full production. If all required equipment is laid away in place on foundations (but not under power) at the producer's site, it would generally require a minimum of nine months for startup. Both of these special cases would involve Government rental of the producer's facilities to accommodate the in-place equipment.

The latter case has, on occasion, been selected for planned production of fuze piece parts. It is advantageous when the production rate for the selected part is relatively low on a per-machine basis, requires a

large bank of special equipment to satisfy high-rate production requirements, and space can be made available by the planned producer. Therefore, if a planned item requires a startup response time of less than 12 months, a cold base could be utilized if the equipment met the in-place layaway conditions of these two special cases. This would permit startup within four or nine months, respectively. Otherwise, a hot or warm base would be required or, in any event, to meet a four months startup need.

The response capability of a cold base is considerably diminished when the planned producer has never made the planned item. Even if the assigned laid-away PEP, together with the producer's equipment, is in existence and in satisfactory condition, processes may need to be determined; tools designed, manufactured, and debugged; personnel must be trained; gages must be provided; and piece part quality levels must be attained.

A cold base is limited to producing an end item (or component) to its configuration at the time of layaway, unless there is a system to provide continuous updating of the technical data package and description of manufacture, with physical upgrading of machine capabilities. Such a system does not exist.

Finally, the condition of equipment laid away for more than about 36 months should be considered suspect, depending upon its condition at the time of layaway and the degree of compliance with specified layaway procedures. If the equipment was laid away in 0-2 condition under strict adherence to preservation specifications under an ideal dehumidified environment, it is possible that reactivation after 15 to 20 years would reveal satisfactorily operable equipment. However, there is still the possibility that elastomers and plastics would deteriorate; hence, hydraulic components and electrical insulation could be subject to breakdown.

A significant conclusion of the equipment layaway study (PEP Modernization Program Task B-4) is that, considering economics alone, it will cost more to produce and stockpile the requisite authorized acquisition objective for a planned item with a cold base than to assign the

particular item to a hot or warm base with a correspondingly lesser authorized acquisition objective. Other costs for a cold base such as transportation, planned item storage, and planned item obsolescence were omitted in the B-4 study for ease of presentation. Their inclusion would further increase the cost differential in favor of a hot or warm base.

Assuming no breakdown in national transport, the location of stored equipment for a cold base is not considered to be a limiting factor, as the time required to transport equipment to a selected site is small compared to the total time involved in startup. However, in the case of producer-owned equipment, usually no assurance exists that it will be available when needed. Layaway of producer-owned facilities is not authorized by current policy, unless the Government can establish a proprietary interest in the facilities, either by purchase or by lease agreement.

Government policy, however, discourages purchase of producer-owned equipment, and ASPR precludes the Government from paying a profit to a producer to lay away his equipment. For this reason, and because there is usually a low production potential, there is little producer interest and incentive to stay in the cold base.

E. RESOURCES/REQUIREMENTS ANALYSIS

1. General

The preceding subsections have highlighted ARRCOM's mobilization planning task, with the goal of achieving effective management of the munitions production base, including the best practicable utilization of the $840 million (original acquisition cost) Government-owned IPE in the light of constantly changing planned item requirements. The following are significant in achieving this goal:

- There is a substantial inventory of non-PEP assigned Government-owned equipment at the producer's plants (i.e., more than 40% of the total).

- About one-half of the PEP assigned IPE is in widely dispersed Government storage.

- Only about 38% of PEP-assigned IPE is active.

- PEP-assigned IPE is assigned to a producer's plant, but not in terms of planned items.

- Government-owned equipment, in general, can be assumed to be in significantly poorer condition than coded, based on recent Government evaluations.

- There are little data on producer-owned equipment.

- The capabilities of the private sector (including COCO's, GOGO's, and GOCO's) need to be correlated to determine planned item capabilities vis-a-vis requirements.

- The response capabilities of production lines in various degrees of readiness (e.g., hot, warm, or cold) need to be assessed against requirements.

This subsection outlines a conceptual yet practical approach to an analysis for effective management of Government-owned equipment. For management to be effective a means of comparing the planned item production requirements with the types, quantities, and conditions of IPE available in the industrial base is a basic and critical need. Such a comparison is not realistic unless private inventories, in addition to Government-owned IPE, are considered. It should be recognized that, for a cold base, this requires an advanced commitment of his own IPE by the planned producer. In essence, the comparison would be a quantitative analysis, designed to meet the primary objective of providing the essential elements of information to enable timely management decisions for allocating IPE in response to the Production Base Plan. These decisions would be pertinent to the following:

- Allocation of IPE to a given planned producer

- Adequacy of the production base capability for a particular planned item

- Impact on planned items or production base that would be induced by transferring equipment between PEP's

- Impact on the production base of introducing a new or redesigned planned item

- IPE availability and condition

It is not envisioned that the analysis be totally automated, although the expected volume of quantitative data is sufficiently large so that the most practical approach is to use electronic data processing.

2. Conceptual Approach

Figure VI-10, "Resources/Requirements Analysis," illustrates the conceptual approach to an analysis designed to meet the needs outlined in paragraph 1, above. The approach utilizes the following inputs, as shown in the figure:

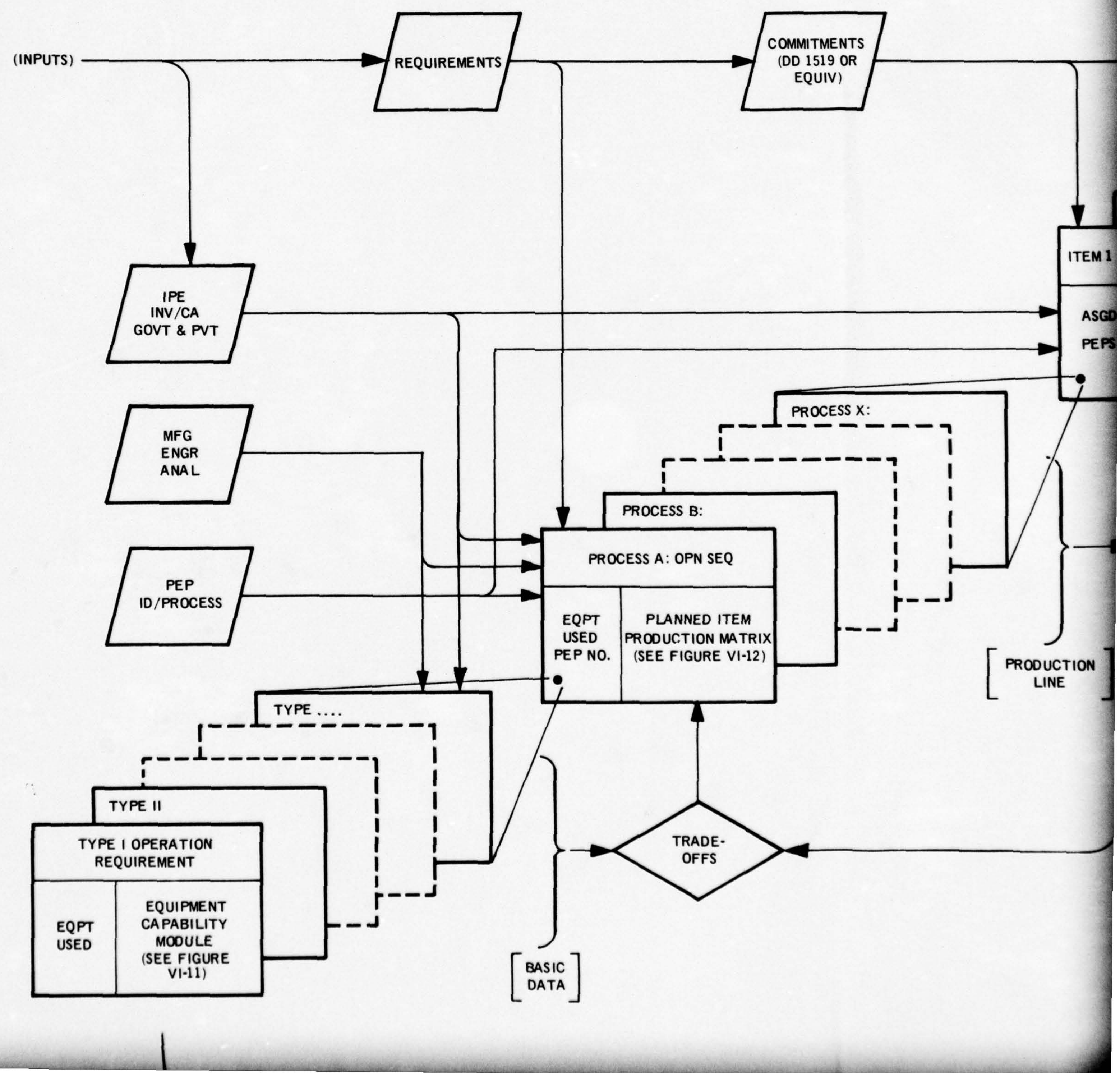
- Production requirements for planned items. These include requirements to be met by not only PEP's, but also GOGO's, GOCO's, and COCO's. Of necessity, commitments for production would be required, either a DD Form 1519 or the equivalent; the commitment to meet requirements is a significant factor in the analysis.

- A complete inventory of relevant IPE, both contractor and Government owned, with a current condition assessment of equipment items. The utility of the inventory will be enhanced if ST, STE, and OPE are incorporated.

- A manufacturing engineering analysis of each planned item, identifying alternative processes and enumerating the types and quantities of IPE needed for a given production rate.

- Identification of individual PEP's, planned items associated with each PEP, and manufacturing processes pertaining to each PEP planned item.

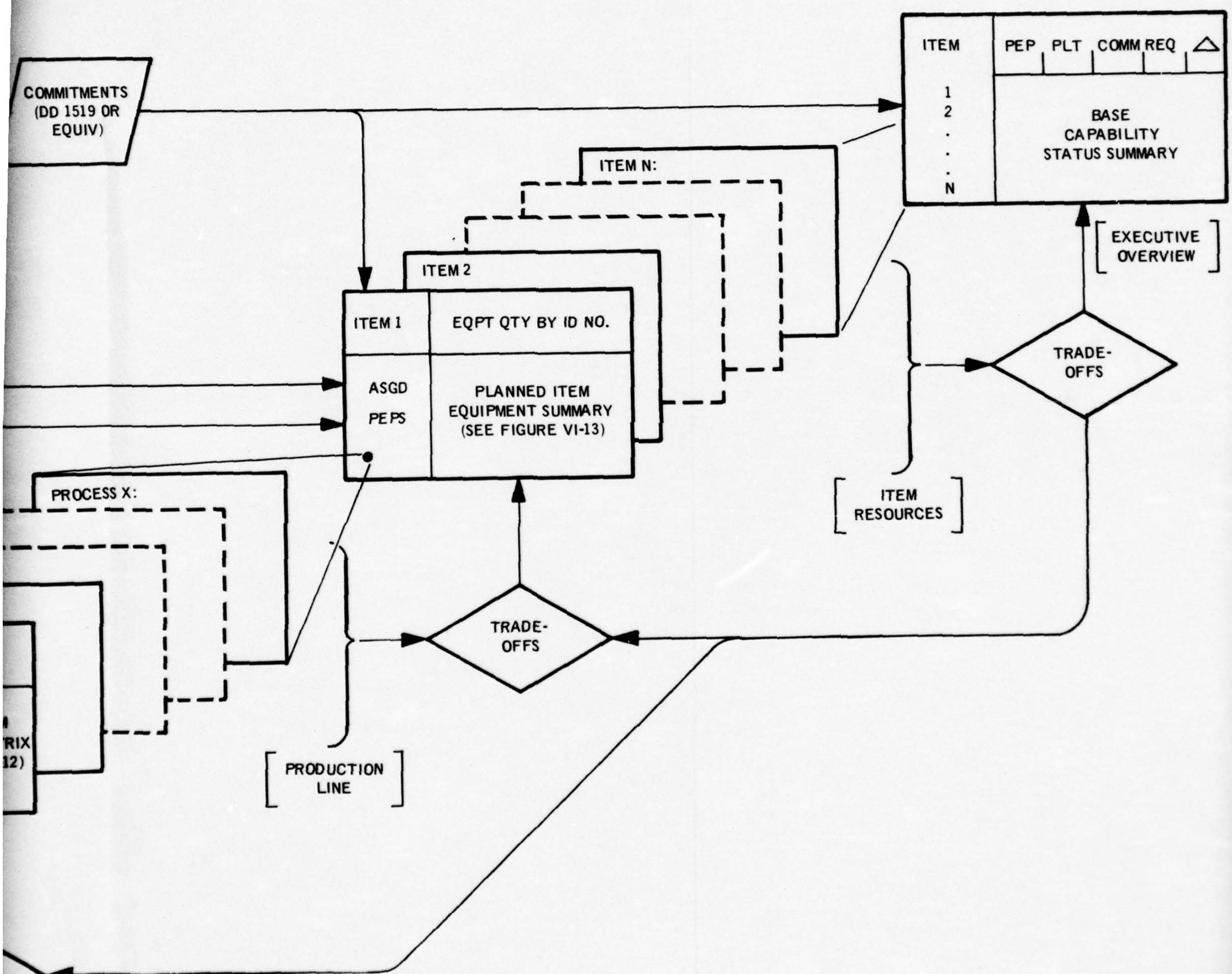
As illustrated in Figure VI-10, the analysis is an integrative process, in which the basic operations for a given machine type and capacity are defined by means of "Operation Requirement/Equipment Capability Modules" (lower left corner) and then assembled, through a sequence of logical steps, to develop a complete overview of the "Base Capability Status Summary" (upper right corner). Concurrent with the data assembly, tradeoff studies identify feasibility and economic guidelines at each stage. The formats shown in Figure VI-10



(INPUTS)
REQUIREMENTS
COMMITMENTS (DD 1519 OR EQUIV)
IPE INV/CA GOVT & PVT
MFG ENGR ANAL
PEP ID/PROCESS
ITEM 1
ASGD
PEPS
PROCESS X:
PROCESS B:
PROCESS A: OPN SEQ
EQPT USED PEP NO.
PLANNED ITEM PRODUCTION MATRIX (SEE FIGURE VI-12)
PRODUCTION LINE
TYPE ....
TYPE II
TYPE I OPERATION REQUIREMENT
EQPT USED
EQUIPMENT CAPABILITY MODULE (SEE FIGURE VI-11)
TRADE-OFFS
BASIC DATA

FIGURE VI - 10

RESOURCES/REQUIREMENTS ANALYSIS



NOTE: FORMATS DETAILED ON FOLLOWING FIGURES

are abridged versions of the suggested data tabulations, which are detailed as follows.

The basic data for the analysis are contained in the "Operation Requirement/Equipment Capability Module," as detailed in Figure VI-11; this defines the equipment capability for a unique operation, such as "turn," "bore," "shear," or "pierce." The module format is self-explanatory; it should be noted that, according to Footnote (2) on Figure VI-11, "PE Capacity" is defined in relation to required machine capacities such as lathe swing or press force and stroke.

The principal tradeoffs available at this level are the equipment condition and options to replace, repair, or rehabilitate. Typically, a piece of equipment could be excluded from succeeding analytical steps here, following findings of poor condition and the option for refurbishment or upgrading not being acceptable. Note that the module is not identified with any specific PEP. Thus, it provides a basic "building block" for succeeding data integrations.

Figure VI-12, "Planned Item Production Matrix," shows the sequence of operations by "Operation Requirement/Equipment Capability Module" for a unique process to produce a given planned item. The sequence is taken from the manufacturing engineering analysis and, in addition to the item, is identified with a particular PEP(s). A separate matrix is prepared for each discrete process identified by the manufacturing engineering analysis. Tradeoffs available at this level are the equipment condition; options to replace, repair, or rehabilitate; and selection of process to optimize PE inventory resources.

Figure VI-13, "Planned Item Equipment Summary," contains integrated data from the Planned Item Production Matrix (Figure VI-12). This tabulation may reflect either a unique planned item or a related "family" of planned items, including the assigned PEP's and production rates. Wholly producer-owned IPE inventories may be identified by a unique symbol. For each basic metalworking operation, the appropriate PE I.D. numbers are cross-referenced to the PEP's to show equipment quantities needed to meet the production rates. The tradeoffs available at this level are adequacy of inventory to meet the required production rates and (from non-PEP PE) equipment available to reinforce the inventory, if required; condition of equipment

FIGURE VI - 11

OPERATION REQUIREMENT/EQUIPMENT CAPABILITY MODULE

OPERATION TYPE: (NAME)

EQUIPMENT (1)							
PEC NO.	ID NO.	MAKE	MODEL	SER NO.	SIZE (2)	RATE (3)	NOTES

SAMPLE FORMAT

NOTES: (1) INCLUDES IPE, ST, STE, OPE: GOVERNMENT & PRIVATE

(2) SIZE BY PE CAPACITY; ie, $1\frac{1}{4}$'' MULTISPINDLE LATHE; 8 - 10'' CHUCKING LATHES; 400-TON PRESS, ETC.

(3) 1000 ITEM/MONTH UNITS

(4) IDENTIFY AND EXCLUDE EQUIPMENT W/CA $<$ 0 - 2 AT THIS LEVEL

FIGURE VI - 12

PLANNED ITEM PRODUCTION MATRIX

ITEM:
PROCESS: (1)
PEP NO.:

SEQUENCE OF OPERATIONS (2)

EQUIPMENT	RATE	CUT	CLEAN	ANNEAL	COAT	CABBAGE PIERCE		CLEAN	ANNEAL	TURN	....
PRESS,	(3)	PE ITEM: MODULE 1 (4)									
LATHE,								(5)		PE ITEM: MOD. V	
BATH,			PE ITEM: MOD. II					PE ITEM: MOD. II			
OVEN,				PE ITEM: MOD. III					PE ITEM: MOD. III		
PRESS,						PE ITEM: MOD. IV					

NOTES: (1) SEPARATE MATRIX FOR EACH PROCESS FOR PRODUCING ITEM

(2) ILLUSTRATIVE ONLY

(3) 1000 ITEM/MONTH UNITS

(4) SEE FIGURE VI - 11 FOR FORMAT

(5) REPEATED MODULE AS APPROPRIATE TO SEQUENCE

FIGURE VI - 13

PLANNED ITEM EQUIPMENT SUMMARY

		TURNING			PRESS						
		ID NO.	. . .	ID NO.	ID NO.	. . .	ID NO.	ID NO.	. . .	ID NO.	RATE
ITEM:	PEP NO. . . . PEP NO.	(1)									(2)
ITEM:	PEP NO. . . . PEP NO.										
ITEM:	PEP NO. . . . PEP NO.										
ITEM:	PEP NO. . . . PEP NO.										

SAMPLE FORMAT

NOTES: (1) EQUIPMENT QUANTITY BY ID & PEP

(2) 1000 ITEM/MONTH UNITS

and options to replace, repair, or rehabilitate; selection of candidate IPE for upgrading; and allocation of production requirements.

The integrated overview of the production base is shown in Figure VI-14, "Base Capability Status Summary." This figure is designed to detail the base capability with reference to specific planned items, with production rates in units of 1000 items/month entered in the intersections of the item rows with the pertinent columns. The columns, from left to right, are as follows:

- o The stub column identifies the planned item.
- o The next three columns are PEP's by number--active, inactive, and X-facility.
- o The next column is other manufacturing plant types: GOGO's, GOCO's, and COCO's. The total capacity figures shown here may reflect part of the totals for the PEP's, with one exception; an entry under "COCO" shows a wholly contractor-owned PE inventory, with no assigned PEP.
- o The "production capability" column shows total production base capability for each item, whether committed or otherwise available; i.e., sum of PEP's and other types, such as COCO's.
- o The "committed" column shows total planned item quantities for which DD Form 1519's have been executed.
- o The next two columns show total current Alternate I and II requirements. If all planning is based on Alternate II requirements, the Alternate I column should be omitted.
- o The final column presents the current difference between the base capability and the Alternate II requirements. Entries in this column may be either positive or negative numbers.

3. <u>Application</u>

The order in which information is assembled is displayed in Figure VI-10. A typical application of this analysis technique is outlined in the following paragraphs.

FIGURE VI - 14

BASE CAPABILITY STATUS SUMMARY

	①				②				③				④			⑤	⑥	⑦	⑧	
PLANNED ITEM	PEP's ACTIVE				PEP's INACTIVE				X FACILITY				OTHER TYPE PLANTS			PRODUCTION CAPABILITY ①+②+③+④	COMMITTED: DD1519	ALT. I REQT.	ALT. II REQT.	ALT. II △ ⑤-⑧
	NO.		. . .		NO.		. . .		NO.		. . .		GOGO	GOCO	COCO					
1.																				
2.																				
3.																				
N - 1																				
N.																				

SAMPLE FORMAT

ENTER QUANTITIES IN 1000 ITEM/MONTH UNITS

The procedure is designed to be iterative, as indicated by the feedback loops in Figure VI-10, with the status summary (Figure VI-14) being both the beginning and end of the analysis.

Suppose, for example, that a planner is reviewing the most recent status summary, and has received a notification of changed requirements for a given planned item. The first step, of course, is to enter the new requirements in the "Alternate I" or "Alternate II" column, as appropriate (it is implicit that Alternate II requirements will always exceed Alternate I requirements).

Second step: Compute "Production Capability" minus "Requirement" and enter the result in the "Delta" column with the algebraic sign of the result. There are two possible results:

- o A zero or a positive number in the "Delta" column shows that production capability for the planned item equals or exceeds the new requirement. In this case, the "committed" column entry is subtracted from "capability" to ascertain capacity in excess of current planned producers. This result provides a guide for determining what PEP's, X-facilities, or other type plants will be assigned, consolidated, or otherwise reassigned to accommodate the new requirement.

- o A negative number in the "Delta" column shows that the new requirement exceed the resources for producing the planned item, irrespective of their status.

This latter event will, essentially, institute a complete resources/requirements analysis for the planned item. This procedure is outlined in the following text; for the moment, the status summary (Figure VI-14) is again considered.

If, for instance, the planned item is a 105mm shell case, certain postulates can be advanced:

- o The item is a member of a "family" of planned items, comprising shell cases in the caliber range 90-106mm.

- o Within the "family" of planned items, machine capacities will generally be equivalent for comparable production processes.

The postulates will suffice for initial decision criteria. The status summary(ies) (Figure VI-14) for the "family" of planned items is examined, with a particular view to identifying positive entries in the "Delta" column in excess of the new planned item quantity. Having identified these excess capabilities, the corresponding excess resources (PEP's, X-facilities, other type plants) are thereby identified, and candidates for conversion to produce the planned item are selected.

At this stage of the analysis, the planned item production matrices (Figure VI-12) are consulted to determine the preferred facility selection. The matrices selected represent both the new planned item and the facilities selected as candidates for conversion to produce the new planned item.

Step-by-step comparisons of the associated manufacturing engineering analyses ("Inputs" as shown in Figure VI-10) are then performed. Hypothesizing that some equipment in the candidate facilities is incompatible with producing the desired item, the selected production matrices would have some voids. These voids would have entries specifying particular types of operation requirement/equipment capability modules (Figure VI-11); non-assigned PE would be then identified to fill the voids from the Government inventory.

The final phase of the analysis is to update the base capability status summary (Figure VI-14) to reflect the reallocation of capability to meet the new planned item requirement. A general approach for this updating is described in the following paragraphs.

Definitions of the basic and irreducible elements of the prodution line--the "basic data" (Figure VI-10) detailed in Figure IV-11--are first required to develop the needed resource information. A given element is a single machine that performs a unique manufacturing operation. The definition is derived from the results of a manufacturing engineering analysis that matches function and capacity of the machine to the operation, without reference to any planned items or PEP's. In turn, the availability of the equipment described can be ascertained with the aid of the IPE inventory and its utility determined by the associated condition assessment. This eliminates equipment that is not suitable for use from further consideration in the

analysis. Benefits would also be realized in reduced EDP time and working file size.

Figure VI-12, "Planned Item Production Matrix," presents a composite of operation requirement/equipment capability modules (Figure VI-11). These modules are selected according to the guidelines provided by the manufacturing engineering analysis and are related to a specific planned item. If alternative approaches are identified by the manufacturing analysis, a separate matrix is prepared for each distinctive production sequence and the numbers of the corresponding PEP's are assigned. As determined from the PE inventory/condition assessment, a wholly owned contractor's inventory would receive a unique identifying symbol.

The operational sequence reflects an objective and explicit manufacturing analysis. The designated equipment is cross-identified with the existing IPE inventory; if this cannot be accomplished, a void is indicated by an entry at the appropriate location in the matrix. Production rates are also drawn from real data. Hence, the matrix in Figure VI-12 does not represent a model line.

Thus, Figure VI-12 presents a feasible planned item production evaluation design that:

- Provides information on the volume capability of the line.
- Shows, by means of the "Rate" column, machine limiting ("pinch") points on production quantities.
- Identifies potential replacements for equipment voids, from the PE inventory/condition assessment search at the basic data level (Figure VI-11).

Figure VI-13, "Planned Item Equipment Summary," consolidates the equipment inventory by planned items with their assigned PEP's. The available quantities of equipment are identified by operation type and I.D. numbers, drawing on the requirements/capability module from Figure VI-11 and operational sequence from Figure VI-12, with the planned item production matrix contributing rate information. Figure VI-13, as a summary, is independent of retention mode, whether it is a hot, warm, or cold base; however, it will identify the current retention status of each PEP listed. If production quantity

requirements for a planned item were increased, the matrix would assist in making a determination to: (a) increase the production rate of a hot base, (b) activate a warm base, or; (c) assemble and start up a cold base.

Figure VI-14, "Base Capability Status Summary," is a complete overview of the industrial production base and contains the essential elements of information needed to trade off PE resources against munitions planning requirements. The format is such that, for each planned item, a single row in the figure supplies the pertinent data, as follows:

- All assigned PEP's, irrespective of status (active, inactive, X-facility), are identified and their production rate capabilities shown by entries at the corresponding row/column intersections. These data are drawn from the planned item equipment summary. (Figure VI-13).

- The "Type Plant" designation is significant to selecting the vehicle for negotiating a production contract. The rates entered in these columns would generally reflect a number of the rates recorded under PEP's; however, the capability of a wholly owned contractor's PE inventory would be shown under "COCO" and a corresponding entry under "PEP" would not appear.

- The sum of all quantities entered under "PEP's" and "Type Plant" is shown in the "Total Capability" column, except X-facilities. This is all resources, committed or not, available to meet planning requirements.

- The next column, "Committed," shows current and planned production quantities for which firm agreements, such as the DD Form 1519 or other means of ensuring the production objective, have been executed. These data can be compared to "Total Capability," to ascertain the production reserve (if any) for meeting potential requirements.

- Comparision of "Total Capability" to "Alternate II Requirement" would produce a difference ("Delta") that, depending on its algebraic value, indicates either a reserve capability in excess of presently anticipated needs or a lack of adequate production resources. Therefore, this entry could be a guide for setting priorities to upgrade or expand the industrial base or,

alternatively, determining what planned items would be least affected by the inactivation or disposal of marginally acceptable production facilities.

4. Illustration

Figures VI-15 to VI-19, inclusive, show how an operation requirement is associated with the equipment. The requirement number given is arbitrary, being drawn from a "model line" report to illustrate the approach. It does, however, represent one means of defining process steps in a manufacturing engineering analysis. For a particular operation, appropriate equipment items in the inventory are listed by I.D. tag numbers, each of which is unique.

Figure VI-20 shows a planned item production matrix, in part, for a fictitious PEP (#999). Note that only single-machine rates are given; as determined from the manufacturing engineering analysis, this shows the minimum complement of equipment needed to produce the planned item.

Figure VI-21 shows a summary of equipment by planned item and PEP; a separate column is assigned to each specific operation number in the general categories shown, or others that are pertinent. This figure also inventories the assigned equipment by I.D. number, as given on the tabulations of Figures VI-15 to VI-19. Press NNN3 (Opn. 1130) was rated 0-3 at CA; a void is indicated (V).

In addition to PEP 999, PEP 015 is hypothesized as producing the same planned item using a different manufacturing process and type of raw stock.

The concept of a planned item "family" is illustrated by designating PEP's 129 (Inactive) and 315 (X-facility) as other production lines for 105mm shell. The "Rate" for the X-facility is an imputed capability which represents the pinch point in the existing inventory of equipment, and cannot be validated or adjusted until assignment to a planned producer.

Figure VI-22 illustrates the three interrelated aspects of base capability:

(1) Production Capability:

This is a validated capability, determined from the producer audit and inventory/CA of the on-site production resources.

(2) Committed Capability:

This is the plant's commitment for mobilization production, as executed on DD Form 1519. It may not have been validated or updated to reflect (1), above, but should be reconciled in due course.

(3) Imputed Capability:

This is applicable to the pinch point in an X-facility, but is not a bona fide production capability until assigned to a planned producer. At this time, the capability would be reevaluated, validated, and categorized under (1), above.

In Figure VI-22, the total M456A1 capability indicates that the validated GOCO capacity is not currently committed for mobilization production. A COCO is shown as part of the 105mm "family" capability, together with the X-facility. The latter is shown in parentheses because it is not included in Column 5, "Capability", pending assignment to a planned producer. Comparing Column 5 with Column 8 shows that the base production resources are under-capacity for the M456A1 requirements, and over-capacity for the other 105mm requirements. Given that the X-facility is activated and the COCO converted to M456A1 production, the indicated Alternate II requirements could be met.

FIGURE VI - 15

OPERATION REQUIREMENT/EQUIPMENT CAPABILITY MODULE

OPERATION TYPE: 1130 - SEPARATE MULTS - HOT SHEAR

EQUIPMENT (1)							
PEC NO.	ID NO.	MAKE	MODEL	SER NO.	SIZE(2)	RATE(3)	NOTES
3442	NNN 1		PRESS, MECH	NNN -	250 T	90	
3442	NNN 2		PRESS, MECH	NNN -	250 T	90	
3442	NNN 3		PRESS, MECH	NNN -	250 T	90	0-3

NOTES: (1) INCLUDES IPE, ST, STE, OPE: GOVERNMENT & PRIVATE

(2) SIZE BY PE CAPACITY; ie, $1\frac{1}{4}$'' MULTISPINDLE LATHE; 8 - 10'' CHUCKING LATHES; 400-TON PRESS, ETC.

(3) 1000 ITEM/MONTH UNITS

(4) IDENTIFY AND EXCLUDE EQUIPMENT W/CA < 0 - 2 AT THIS LEVEL

ILLUSTRATIVE ONLY

FIGURE VI - 16

OPERATION REQUIREMENT/EQUIPMENT CAPABILITY MODULE

OPERATION TYPE: 1160 - CABBAGE & PIERCE

EQUIPMENT (1)							
PEC NO.	ID NO.	MAKE	MODEL	SER NO.	SIZE(2)	RATE(3)	NOTES
3442	NNN 1		PRESS, MECH	NNN -	1700 T	200	
3442	NNN 2		PRESS, MECH	NNN -	1700 T	200	

NOTES: (1) INCLUDES IPE, ST, STE, OPE: GOVERNMENT & PRIVATE

(2) SIZE BY PE CAPACITY; ie, $1\frac{1}{4}$" MULTISPINDLE LATHE; 8 - 10" CHUCKING LATHES; 400-TON PRESS, ETC.

(3) 1000 ITEM/MONTH UNITS

(4) IDENTIFY AND EXCLUDE EQUIPMENT W/CA < 0 - 2 AT THIS LEVEL

ILLUSTRATIVE ONLY

FIGURE VI - 17

OPERATION REQUIREMENT/EQUIPMENT CAPABILITY MODULE

OPERATION TYPE: 1180 - PHOSPHATE & LUBRICATE

EQUIPMENT (1)							
PEC NO.	ID NO.	MAKE	MODEL	SER NO.	SIZE(2)	RATE(3)	NOTES
3426	NNN 1		CHEM LINE	NNN -		100	
	• • •						
3426	NNN 17		CHEM LINE	NNN -		100	

NOTES: (1) INCLUDES IPE, ST, STE, OPE: GOVERNMENT & PRIVATE

(2) SIZE BY PE CAPACITY; ie, $1\frac{1}{4}$'' MULTISPINDLE LATHE; 8 - 10'' CHUCKING LATHES; 400-TON PRESS, ETC.

(3) 1000 ITEM/MONTH UNITS

(4) IDENTIFY AND EXCLUDE EQUIPMENT W/CA < 0 - 2 AT THIS LEVEL

ILLUSTRATIVE ONLY

FIGURE VI - 18

OPERATION REQUIREMENT/EQUIPMENT CAPABILITY MODULE

OPERATION TYPE: 1200 - HEAT TREAT

EQUIPMENT (1)							
PEC NO.	ID NO.	MAKE	MODEL	SER NO.	SIZE(2)	RATE(3)	NOTES
3424	NNN	FURNACE			NNN	100	

NOTES: (1) INCLUDES IPE, ST, STE, OPE: GOVERNMENT & PRIVATE

(2) SIZE BY PE CAPACITY; ie, $1\frac{1}{4}$'' MULTISPINDLE LATHE; 8 - 10'' CHUCKING LATHES; 400-TON PRESS, ETC.

(3) 1000 ITEM/MONTH UNITS

(4) IDENTIFY AND EXCLUDE EQUIPMENT W/CA < 0 - 2 AT THIS LEVEL

ILLUSTRATIVE ONLY

FIGURE VI - 19

OPERATION REQUIREMENT/EQUIPMENT CAPABILITY MODULE

OPERATION TYPE: 1240 - TURN

EQUIPMENT (1)							
PEC NO.	ID NO.	MAKE	MODEL	SER NO.	SIZE(2)	RATE(3)	NOTES
3416	NNN 1	LATHE, AUTO CHUCK, 15HP		NNN -	6 IN	2.5	
	• • •						
3416	NNN 153	LATHE, AUTO CHUCK, 15HP		NNN -		2.5	

NOTES: (1) INCLUDES IPE, ST, STE, OPE: GOVERNMENT & PRIVATE

(2) SIZE BY PE CAPACITY; ie, $1\frac{1}{4}$'' MULTISPINDLE LATHE; 8 - 10'' CHUCKING LATHES; 400-TON PRESS, ETC.

(3) 1000 ITEM/MONTH UNITS

(4) IDENTIFY AND EXCLUDE EQUIPMENT W/CA < 0 - 2 AT THIS LEVEL

ILLUSTRATIVE ONLY

FIGURE VI - 20

PLANNED ITEM PRODUCTION MATRIX

ITEM: SHELL, HEAT-T, M456A1-105MM
PROCESS: (1) ALT. A, STEEL BILLET
PEP NO.: 999

SEQUENCE OF OPERATIONS (2)

EQUIPMENT	RATE (3)	CUT	CLEAN	ANNEAL	COAT	CABBAGE PIERCE		CLEAN	ANNEAL	TURN	HEAT TREAT
PRESS,	90										
LATHE,	2.5									1240	
BATH,	100				1180						
OVEN,	100										1200
PRESS,	200					1160					

NOTES: (1) SEPARATE MATRIX FOR EACH PROCESS FOR PRODUCING ITEM
(2) ILLUSTRATIVE ONLY
(3) 1000 ITEM/MONTH UNITS

ILLUSTRATIVE ONLY

FIGURE VI - 21

PLANNED ITEM EQUIPMENT SUMMARY

		TURNING			PRESS			BATH			
		ID NO. (1)	. . .	ID NO.	ID NO.	. . .	ID NO.	ID NO.	. . .	ID NO.	RATE (2)
ITEM: SHELL, 105MM HEAT-T, M456A1 ALT. A, STEEL BILLET	PEP NO. 999	NNN 1 • • • NNN 80			NNN 1		NNN 1 NNN 2 NNN 3(V)	NNN 1 NNN 2			200
ITEM: SHELL, 105MM HEAT-T, M456A1 ALT. B, TUBING	PEP NO. 015	NNN 81 • • • NNN 145			NNN 2			NNN 3 NNN 4			150
ITEM: SHELL, 105MM	X-FAC. 315		NNN 1 • • • NNN 30			NNN 1 NNN 2			VOID		(75)*
ITEM: SHELL, 105MM	PEP NO. 129										110

*-( ) - PINCH POINT OF EXISTING INVENTORY

NOTES: (1) EQUIPMENT QUANTITY BY ID & PEP
(2) 1000 ITEM/MONTH UNITS

ILLUSTRATIVE ONLY

FIGURE VI - 22

BASE CAPABILITY STATUS SUMMARY

PLANNED ITEM	1 PEP's ACTIVE				2 PEP's INACTIVE				3 X FACILITY				4 OTHER TYPE PLANTS			5 PRODUCTION CAPABILITY	6 COMMITTED: DD1519	7 ALT. I REQT.	8 ALT. II REQT.	ALT. II
	NO.	999	. . .	015	NO.	129	. . .		NO.	315	. . .		GOGO	GOCO	COCO	1+2+3+4				$\triangle$ 5-8
1. M456A1		200		150										175		525	350		650	-125
2. -105MM						110				(75)*					150	260	375		175	85
3.																				
N - 1																				
N.																				

ENTER QUANTITIES IN 1000 ITEM/MONTH UNITS

*-( ) - NONVALIDATED CAPACITY

ILLUSTRATIVE ONLY

VII. SKILLS

A. GENERAL

This section analyzes and discusses those personnel skills needed to produce munitions metal parts in the private sector. An overview of the analysis of skills shortages and a discussion of possible solutions are presented below.

B. OVERVIEW OF SKILLS SHORTAGES

Skills shortages must be considered in private sector munitions production because the availability of skilled personnel, either in quantity or category, cannot be assumed for any particular future time when mobilization production may be required. Skills shortages during such an emergency can be anticipated and forestalled to some degree by analysis and advance planning.

A logical starting point for such an analysis is to examine general categories of the skills requirements of munitions producers as listed below:

- Managerial and administrative
- Manufacturing engineering
- Production planning and control
- Equipment setup
- Equipment operation
- Tool and die making
- Maintenance (equipment and facility)
- Other supporting skills

These categories identify the types of skills required for the production base. These types of skills are addressed in this section of the report.

Producer skill requirements fluctuate widely when PEP's are placed alternately in layaway and production. This study, therefore, addresses all of the producer's skills for operating, supporting, and maintaining a PEP facility.

Producer skill development needed for munitions metal parts production ranges from a few hours of on-the-job training (OJT) for simple tasks, up to 15 or 20 years for a toolroom foreman, as shown in Table VII-1. The term "simple machines" as used in Table VII-1

TABLE VII-1
SKILL LEVELS NEEDED FOR MUNITIONS PRODUCTION

	Skill Category	Typical Training Requirements
1.	Operation of simple machines	One week OJT + 90 days close supervision
2.	Operation of complex machines	90 days OJT + 1 year close supervision
3.	Machining foreman	10 years experience
4.	Setup man	2-4 years OJT + 2 years experience
5.	Inspectors	
	a. Semiskilled	1 week OJT
	b. Journeyman	2-4 years OJT
6.	Tool and die maker) Tool and cutter grinder)	4 years OJT + 4 years experience
7.	Toolroom foreman	15-20 years experience
8.	Machine rebuilder	4 years OJT + 4 years experience
9.	Engineering	8 years total education and experience

refers to equipment such as punch presses, grinders, drill presses, and material handling equipment. "Complex machines" designates equipment such as automatic screw machines, gear hobbers, and multi-station way machines. "Engineering" includes manufacturing engineering, tool engineering, and metallurgical engineering. The problem for a producer is to muster enough workers with the required skills to satisfy the assigned production startup curve or at least to achieve an attainable rate from the addition of on-line production equipment.

Critical skills have been reported by PBM as the limiting factor in the production base for fuzes. There was a decrease of 18 percent in the availability of critical skills in the U.S. watch industry between a 1965-67 survey and a 1972 survey (Industry/Department of Labor/MUCOM Survey and Briefing, Nov. 1972). In addition , both the National Tool & Die and Precision Machining Association and the trade magazine "Production,", reported that the skilled manpower available was 25 percent less than industry needs (ARRCOM Briefing, 1975). While it is a producer's problem to obtain personnel, it should be the Government's concern to audit the availability of an adequate supply of skills, both for surge requirements and full mobilization.

If only recent short-term conditions are examined, a case can be made that no skills shortage exists. The tool and die industry experienced a downturn starting in October of 1974, and some firms were down to 15 percent of their normal employment level by June 1975 ("Iron Age," June 16, 1975) This marked decrease in employment indicates that tool and die makers should be readily available today. Similarly, the molding market was off 20 to 25 percent recently. Many other recent employment declines can be cited.

Industrial preparedness planning (IPP), however, cannot rely on temporary labor surpluses caused by swings of the economic cycle because the timing of a partial or total mobilization cannot be predicted. The long-term trend of skills supply and demand must be considered, and the short-term economic cycle must be ignored.

The long-term outlook for skills supply is one of shortages. The Bureau of Labor Statistics (BLS) has projected the average annual openings over the period 1972 through 1985 for hundreds of vocations. BLS has also surveyed current output from various skills training programs for those vocations. Table VII-2 shows extracts of that data for six vocations which are most relevant to the munitions metal parts production program. The table shows that

TABLE VII-2
SKILLS SHORTAGES
(From BLS Bulletin 1824, Occupational Manpower and Training Needs, Rev. 1974)

	Skill	Average Annual Openings 1972-1985	Present Annual Training Output From Gov't Programs, Vocational Schools, And Apprenticeships	Present Average Annual Deficit
1.	Foundry (patternmakers, molders and coremakers)	2,025	276	1,749
2.	General machinists	13,100	3,988	9,112
3.	Instrument makers (mech.)	200	20	180
4.	Machine tool operators	25,600	2,810	22,790
5.	Setup men	2,200	543	1,657
6.	Tool & die makers	4,200	4,102	98

average annual openings or requirements exceed present annual training output for all six of those vocations.

BLS vocational definitions, including the six listed in Table VII-2, are much broader than the skill categories which PBM used in the 1976 active producer skills study. For example, where BLS uses broad categories such as machine tool operators and setup men, the PBM study has more narrowly defined categories such as:

- Hairspring truer
- Hairspring vibrator
- Hairspring vibrator setup man
- Hobbing machine setup man
- Line attendant
- Pinion and gear hobbing foreman
- Press room foreman
- Profiling machine setup operator
- Rotary machine setup man
- Screw machine foreman
- Screw machine setup man
- Setup man, manufacturing

The PBM skills study is obtaining individual producers' skill requirements in narrowly defined categories such as those listed above. However, there is no comparable source of data on the availability of skills in such narrowly defined categories. Therefore, it is suggested that the broader BLS categories be used to obtain skills availability with the understanding that some training may be required to obtain proficiency in the more narrowly defined categories.

If adequate data on skills availability could be obtained for individual labor markets, then producers could be selected from areas with the highest availability for the skill categories which they require for their planned items, processes, equipment, etc. BLS does have some regional information on skills availability; however, individual labor markets within the regions are neither identified nor quantified. Data for individual labor markets will have to be acquired by contacting individual state manpower agencies.

Obtaining skills availability data for specific labor markets would require multilateral surveys beyond the resources of this analysis. However, BLS is developing a national manpower matrix which should

provide the needed data; this is discussed under Subsection VIII.C., "Analysis and Solutions."

A major factor that induces skill shortages is pay-scale/skill disparity. When a laborer receives almost as much pay as a machinist, and a truck driver or a worker in the construction trades can earn much more, there is little incentive for machinist training. This trend is not limited to munitions metal parts manufacture, and has a far-reaching impact on the nation's entire economy; any viable solution to the problem must be sought on a national level. Meanwhile, the problem can be circumvented partially in the following ways:

(1) Choose producers in labor markets where the availability problem is least severe.

(2) Consider skills availability when selecting equipment.

(3) Encourage producers to pay above-scale wages to attract the hard-to-obtain skills.

A skills clause should be added to facilities contracts. It should name the critical skills and staffing levels which are required for the contractor to meet the DD1519 production rates. The initial contract should require and pay the producer to submit a plan for providing those skills when directed to do so by the Government. The plan should be reviewed annually and the producer should update it to reflect changing trends in skills availability or changes in manufacturing requirements.

C. ANALYSIS AND SOLUTIONS

1. Decision Analysis

This analysis of skills in private sector munitions metal parts production suggested 13 possible solutions for alleviation of skills shortages. Table VII-3 lists these possible solutions in random order. The various solutions employ three general approaches:

- o Increasing the skills supply
- o Decreasing the requrements for skills
- o Matching skills requirements to areas of greatest supply

TABLE VII-3
POSSIBLE SOLUTIONS FOR SKILLS SHORTAGES

1. Trained cadre
2. Better documentation
3. Computer-aided design/computer-aided machining (CAD/CAM)
4. Wage incentive
5. On-the-job training
6. Training at startup
7. Local trade schools
8. Union apprenticeship programs
9. College/industry/PEP training program
10. Reserve corps
11. MIS-skills requirements/availability
12. Initial overstaffing
13. National-state industry-occupational matrix system (national manpower matrix)

Qualitative analysis of the possible solutions was performed and the results are shown in Table VII-4 (following Subsection 2). This table shows the effect of each possible solution on the skills situation, as well as the advantages and disadvantages of each solution. It also indicates which of the solutions is more applicable to surge requirements and which is more applicable to mobilization requirements.

Qualitative analysis was then carried a step further by using a decision matrix for comparing the various solutions. This decision matrix is shown as Table VII-5 (following Subsection 2). In this matrix, the highest score represents the most advantageous solution; the lowest score represents the least advantageous solution. Since this decision process is subjective, the scores should not be considered as giving a precise order of preference. The resulting ranking, however, does indicate the imputed benefits for the munitions metal parts production base.

2. Decision Analysis Results

Results of the decision analysis presented in Paragraph VII.B.1 provide a basis for ranking various solutions to the skills-shortages problem in order of decreasing benefits. These solutions are now discussed in that order.

a. The College/Industry/PEP training program would be a coalition between ARRCOM and other Government agencies, a PEP producer, and a leading polytechnic college in the producer's local area. Since this solution showed more benefits than any other choice and only two apparent disadvantages, it appears to be the leading choice. This solution will be discussed at greater length in Paragraph VII.C.3.

b. The trained cadre would be a small team of key people with critical skills. Ideally, this team should represent the best people from the producer's previous production contract. The payroll for the cadre would be the significant cost element; this could be funded through the layaway maintenance contract.

   The PEP must be laid away in a hot or warm base to maintain cadre training. The cadre would exercise the equipment piece by piece and maintain the equipment. Also, the cadre

would obtain any revisions to the TDP and would determine the effect of those revisions on the PEP. Where voids develop, the cadre would be responsible for filling the voids. For preparedness planning, the cadre would be the source of data to determine the producer's capability for new planned items. During start-up, the cadre would recruit and train the work force, would execute the first production runs, and would be the source of key personnel for the expanding organization as the production volume increases.

The cadre should retain the very best and most versatile setup men in the plant. In one case (Chamberlain, New Bedford), however, the UAW negotiated a contract which prevents the setup men from reverting to machine operation. Such contracts would need to be renegotiated to obtain maximum benefits from the trained cadre concept.

The trained cadre concept scored highly because it permits retaining the best people, keeping the equipment at a high state of readiness, starting the production line almost immediately at low level, and shortening reactivation time.

c. On-the-job training is self-descriptive and, scoring near the top of the list, is consistent with its widespread use in industry. This possible solution to the skills shortages problem should probably be used in every case, irrespective of ranking and any other solutions used.

d. The next most desirable solution to the skills shortages problem is to improve the documentation. This solution will decrease dependence upon skilled setup men, and it will eliminate dependence on the machine operator's memory. The documentation should be complete enough to allow a relatively inexperienced worker to follow the procedure step by step and the cost of such improved documentation could be borne partly by current production contracts and partly by layaway contracts. Cost of updating the documentation resulting from TDP changes would be borne by the layaway maintenance contract. Better documentation is another solution usable in most cases regardless of ranking and other solutions used.

e. A reserve corps for PEP skills would establish a reserve unit at a PEP plant. This reserve unit would function similarly to an Army reserve unit, and its members would be

paid for attending meetings at the producer's plant. A unit could be staffed from members of the producer's organization when the plant was previously active. The reserve unit would function similarly to a skilled cadre; however, the effectiveness of the reserve unit would vary in proportion to the training time spent at the plant. As an example, the reserve unit might meet one day a month, a relatively short time compared to that of a full-time skilled cadre. On the plus side, the reserve unit would provide continuing contact with skilled personnel from previous production operations and thus would facilitate their retrieval when they were needed for an emergency.

f. Under union apprenticeship programs, unions can bring in apprenticeship graduates from their own locals, or a union can also bring in permit workers trained in apprenticeship programs in other union locals. This solution to the skills shortage problem tends to increase the local and national skills pool. One disadvantage is also apparent; i.e., apprenticeship graduates of a given union are only available to plants having that particular union. As a matter of interest, out of the first nine plants visited for modernization study under Task B-5, only three were fully unionized, one had only the welders unionized, and five were nonunion. Apprenticeships can be in some other metalworking industry so that the basic skills are acquired even though munitions metal parts are not being produced. Furthermore, once the basic skills have been learned, the reserve corps concept can be used to indoctrinate apprentices in actual munitions production.

g. Local trade schools should be persuaded to add courses for developing the key skills needed for the local PEP's. One disadvantage of the trade schools solution is its inherent lack of response to a producer's manpower surges.

h. The national manpower matrix (NMM) is a program being conducted to develop occupational and employment projections for state and local areas to use in manpower and educational planning. This program, the National-State Industry-Occupational Matrix System, is being carried out by the Bureau of Labor Statistics, the Manpower Administration, and individual state employment agencies. NMM will provide the entire country with a data base covering the total economy; specifically, it will allow for development of projections

for approximately 400 occupations in 200 industries. The system is now operational for all states and approximately 110 of the Standard Metropolitan Statistical Areas; however, most of the information needed to load the data bank still must be obtained from the state agencies. When operational, this system would provide data for evaluating the skills position of competing manufacturers in different areas.

i. Wage incentives are an obvious solution for attracting new talent; i.e., the producer offers a higher wage. In this case skills are not developed, just enticed from other industries. This solution is applicable to surge requirements because commercial production provides a labor pool from which workers can be attracted to meet surge requirements. Higher wages are not a solution during mobilization, however, because of controls and manpower allocation.

j. Training at startup would involve delaying startup to enable a trained cadre, a reserve corps, or a specially recruited group of key people to devote their full efforts to intensive training of sufficient personnel to start production. Thus, when production did start, it would start at a higher rate than if only the key personnel had been used for startup. Training at startup would then be followed by OJT of additional groups to fit the startup requirements curve.

k. CAD/CAM, or numerical control (NC), helps solve the skills problem by decreasing the operator skills requirement. The operators need not be as skilled because the work would be limited to watching the machines run, loading and unloading them if handling is not automated, and changing tooling. Since such operators can often handle more than one machine, the work force could be decreased; this is partially offset by the larger maintenance staff required and the higher skill levels required for maintenance of the NC equipment. NC equipment would be laid away with the programs and with the setup and tooling documentation. The strongest deterrent to numerical control is its cost; buying new equipment with integrated NC is normally more practical than trying to convert manual equipment. The "Impact of Automation/Mechanization on Startup Time" report (PEP Modernization Program Task F) also addresses this general problem area.

l. Initial overstaffing would compensate for low skills and low productivity near the beginning of startup by using more equipment and more operators than would normally be required at full production. In other words, the output of the additional equipment and operators would partially compensate for the low productivity, the low position on the learning curve, and the higher initial reject rate. As production bulds up, the producer can "cull" the least productive operators and machines. This solution has been used by PEP producers to obtain faster production buildup, but it is an inefficient method and difficult to accomplish if a union is involved.

m. The MIS-Skills Requirements/Availability concept would include skills information in the data processing system for resource management. This solution would require data files for skills requirements and availability. Skills requirements would be based on model line matrices, with individual adjustments to skills requirements and labor units varying between producers. Skills availability could be established on a geographical basis using BLS or state information. These requirements and availability files could be compared by the resource management system to evaluate the skills position of competing manufacturers and thus help in selecting planned producers and in awarding bids. Data on skills requirements and availability are not readily available now; however, by the time the resource management system is operational, it is anticipated that the data will be available and thus the ranking of this solution will increase.

TABLE VII-4
SKILLS SHORTAGES
ANALYSIS OF POSSIBLE SOLUTIONS

POSSIBLE SOLUTION	EFFECT ON SKILLS	ADVANTAGES	DISADVANTAGES
Trained cadre	Retains a cross section of required skills	Permits holding on to best people Keeps equipment at high state of readiness Can start producing almost immediately at low level Cadre can conduct training at startup and OJT Shortens reactivation time Applicable to surge or MOB	Possible apathy and boredom Increased maintenance cost during layaway Some unions present obstacles
Better technical documentation	Reduces skill levels required	Reduces skill levels required Eliminates dependence on memory Shortens reactivation time Applicable to surge or MOB	Increases layaway cost
CAD/CAM	Reduces skill levels required	Reduces operators' skill requirement Fewer operators required Lower reject rate Applicable to surge or MOB	Increases maintenance staff and skill level required New equipment required, so high capital cost
Wage Incentive	Attracts skills from other sources	Provides skills quickly Reduces OJT time required Shortens reactivation time	Premium wages increase production costs Applicable to surge requirement but not full MOB Does not reduce skill requirements

TABLE VII-4 (Cont)

POSSIBLE SOLUTION	EFFECT ON SKILLS	ADVANTAGES	DISADVANTAGES
On Job Training	Raises skill levels at producer's plant	Tax incentives Can be used singly or with other concepts such as Trained Cadre, Reserve corps, etc. Good for training replacements after reaching full production Relatively low cost, as trainees produce while learning Non-Army Government funding may be available Raises skill levels at producer's plant	Sometimes opposed by unions Slow way to start up a line Can increase reject rates
Reserve Corps	Retains cross section of required skills	Permits keeping track of best people and refreshing their skills Corps could maintain and exercise at least some of the equipment Corps could conduct training at startup and OJT Lower cost than trained cadre Funding might be available from non-Army training programs	Applicable to full MOB but not necessarily to surge requirements because Corps members may not be willing to leave their other jobs Reserve Corps' skill levels would probably not be maintained in as high a state of readiness as those of full time trained cadre
MIS - Skills Requirements/ Availability	Skills requirements and availability compared by computer	Could show which producers have highest skills availability Could use for selecting planned producers Could use for evaluating bids for current production Could use to show producers where to look for skills	Questionable present practicability Questionable present cost/benefits High file maintenance costs Partial duplication of BLS' and Manpower Administration's National-State Industry-Occupational Matrix System

TABLE VII-4 (Cont)

POSSIBLE SOLUTION	EFFECT ON SKILLS	ADVANTAGES	DISADVANTAGES
Initial Overstaffing	Quantity instead of quality	Partially compensates for low skill levels Permits faster startup Permits screening workers and retaining the best	Inefficient Higher reject rate Requires excess equipment May not be as applicable to MOB as to surge because of manpower controls May increase production costs
Nationwide Manpower Matrix by BLS and Manpower Administration	Increases skills visibility nationwide	Will show situation for each labor market Will show where vocational training should be emphasized Can use in selection of planned producers Can use for evaluating bids for current production Can use to show producers where to look for skills	Indefinite date for system to be fully operational
Training at Startup	Raises skill levels at producer's plant	Raises skill levels at producer's plant Provides sufficient people to start production Ratio of trainees to instructors can be much higher than for OJT Leads into OJT after production starts Non-Army Government funding may be available Applicable to surge or MOB	Delays start of production

TABLE VII-4 (Cont)

POSSIBLE SOLUTION	EFFECT ON SKILLS	ADVANTAGES	DISADVANTAGES
Local trade schools	Increases local pool of skills	Continuing increase in local skills pool May be funded under Manpower Development and Training Act Does not necessarily require funding from producer	Unresponsive to producer's manpower surges Producers must persuade schools to train the skills they need
Union Apprentice Program	Increases local and national pool of skills	Continuing increase in local skills pool Continuing increase in national skills pool from which local union can obtain permit workers	Skills controlled by the union Skills not available to a producer with another union or unwilling to unionize
College/Industry/ PEP training program	Increases local pool of skills	Curriculum tailored to producer's skill requirements Establishes rapport between producer and students Keeps equipment at high state of readiness Applicable to surge or MOB Plant already producing at start of buildup curve At least part of funding should be available from non-Army Government training programs Permits training Government personnel in addition to skills for producer Fast response time Current students, staff and recent graduates could all be made available for MOB Affords justification for Government funded jobs to combat high unemployment rate of the short-term economic cycle*	Would be difficult to administrate because of multiple interfaces* Would be difficult to motivate companies and educators to have real commitment to revive vocational technology training*

TABLE VII-4 (Cont)

POSSIBLE SOLUTION	EFFECT ON SKILLS	ADVANTAGES	DISADVANTAGES

*These added points are not considered in the calculation of the "Evaluation of Techniques to Assure Availability of Skilled Personnel" (Table VII-5) because of the time and manpower limitations. It is concluded, however that inclusion of these considerations in Table VII-5 would have no effect on final ranking of the possible solutions to the skills shortages problem.

TABLE VII - 5

DECISION MATRIX

EVALUATION OF TECHNIQUES TO ASSURE AVAILABILITY OF SKILLED PERSONNEL

	DECISION ELEMENTS	MAXIMUM POSSIBLE SCORE
EFFECT ON SKILLS	Holding on to key personnel	4
	Reduces skill levels required or partially compensates for low skill levels or increases existing skills	4
	Eliminates dependence on memory	4
	Reduces manpower requirements	4
	Attracts skills from other sources	2
	Expands outside skills pool	2
	Can be tailored to producers' skill requirements	3
	Permits training Government personnel in addition to producer's	1
	Permits screening workers and retaining the best	3
	Shows where vocational training should be emphasized	1
TIMING CONSIDER-ATIONS	Applicable to surge requirements	4
	Applicable to, mobilization requirements	4
	Earlier initial production	4
	Accelerates startup	4
	Improves equipment readiness	4
	Responsiveness to producer's changing manpower demands or reducing impact thereof	3
COST EFFECTS	Reduces cost to lay away	4
	Reduces layaway maintenance cost	4
	Reduces production cost	4
	Reduces other costs	4
	Special funding not required	3
	Producer not involved in funding	1
	Lowers reject rate	1
	Tax incentives	1
	Possibility of non-Army Government funding	4
MISCELLANEOUS CONSIDERATIONS	Minimizes possible union problems	1
	Provides visibility of skills pool	4
	Shows producers with highest skills availability	2
	Usable for selecting planned producers	1
	Usable for evaluating producers' bids	1
	Avoids duplication of BLS program	2
	Present practicability	12
	Total Score	100
	RANK	

POSSIBLE SOLUTIONS

	MAXIMUM POSSIBLE SCORE	TRAINED CADRE	BETTER DOCUMENTATION	CAD/CAM	WAGE INCENTIVE	ON-JOB TRAINING	TRAINING AT STARTUP	LOCAL TRADE SCHOOLS	UNION APPRENTICE PROGRAM	COLLEGE/INDUSTRY/PEP TRAINING PROGRAM	RESERVE CORPS	MIS SKILLS REQUIREMENTS/ AVAILABILITY	INITIAL OVERSTAFFING	NATIONAL MP MATRIX
	4	4	0	0	4	0	0	0	0	2	3	0	0	0
levels	4	0	3	4	0	4	4	1	1	4	1	0	3	0
	4	0	4	4	0	0	0	0	0	0	0	0	0	0
	4	1	1	4	0	1	1	0	0	0	0	0	0	0
	2	1	0	0	2	0	0	0	2	1	1	0	0	0
	2	0	0	0	0	0	0	2	2	2	0	0	0	0
	3	3	0	0	1	3	3	1	0	3	3	3	2	0
	1	0	0	0	0	0	0	0	0	1	1	0	0	0
	3	3	0	0	0	1	1	1	0	1	3	0	3	0
	1	0	0	0	0	0	0	0	0	0	0	1	0	1
	4	4	4	4	4	4	4	4	4	4	2	4	4	4
	4	4	4	4	0	4	4	4	3	4	4	4	1	4
	4	4	3	4	4	0	0	1	1	4	2	0	0	0
	4	4	3	4	4	2	0	0	0	4	1	1	4	1
	4	4	0	0	0	0	0	0	0	4	2	0	0	0
impact thereof	3	0	0	2	3	2	0	0	3	1	0	0	3	0
	4	3	2	1	4	4	4	4	4	4	3	4	4	4
	4	0	4	2	4	4	4	4	4	4	2	4	4	4
	4	4	3	0	0	1	3	3	1	3	3	3	0	3
	4	4	4	0	4	4	2	4	4	4	4	0	0	4
	3	3	3	0	3	3	1	3	3	2	1	3	3	3
	1	0	0	0	0	0	0	1	1	0	1	1	0	1
	1	1	1	1	0	0	1	0	0	0	0	0	0	0
	1	0	0	0	0	1	0	0	0	1	0	0	0	0
	4	1	0	0	0	4	4	4	4	4	3	0	0	4
	1	0	1	1	0	0	1	1	0	1	1	1	1	1
	4	0	0	0	0	0	0	0	2	1	0	4	0	4
	2	0	0	0	0	0	0	0	0	0	0	2	0	0
	1	0	0	0	0	0	0	0	0	0	0	1	0	1
	1	0	0	0	0	0	0	0	0	0	0	1	0	1
	2	1	1	1	1	1	1	1	1	1	1	0	1	1
	12	12	12	12	12	12	12	12	12	12	10	0	12	10
	100	61	53	48	50	55	50	51	52	72	52	37	45	51
		2	4	8	7	3	7	6	5	1	5	10	9	6

2

3. College/Industry/PEP Training Program

As previously noted, the College/Industry/PEP training program would be a coalition between ARRCOM (and other Government agencies), a PEP producer, and a leading polytechnic college in the producer's local area. In this coalition, the Government would contract with a major PEP-assigned producer and a polytechnic college in the same area.

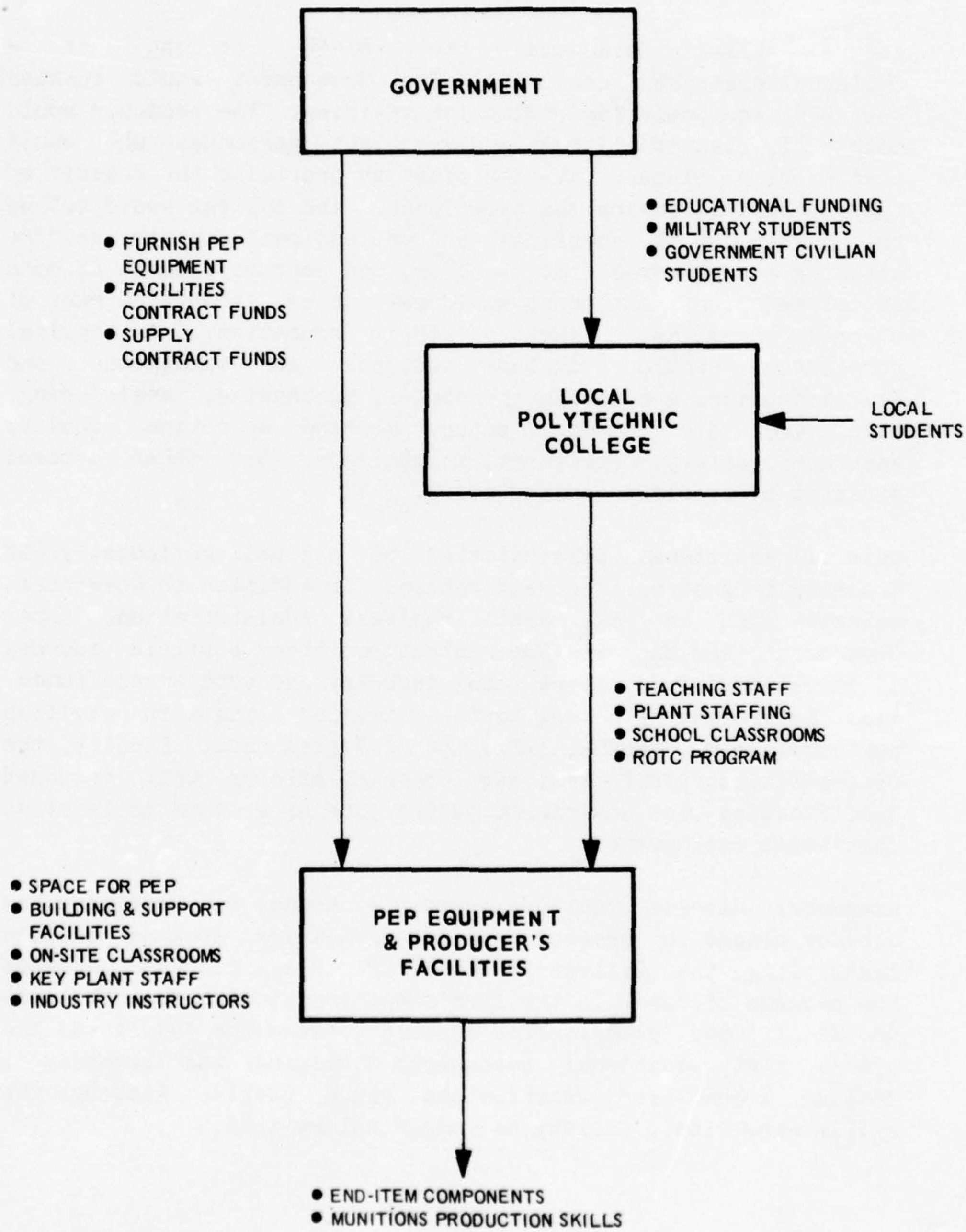
Figure VII-1 diagrams the basic concept of a College/Industry/PEP coalition. The Government would furnish the PEP equipment for production training. The producer would commit his plant facilities and key plant personnel who would assist with classes at the plant by providing the benefit of their practical on-the-job experience. The college would set up the curriculum for vocational and professional degrees, provide teaching staff, enroll the students, and conduct classes at both school and plant. Students would make actual production runs of planned items as a part of their education. A typical curriculum would include courses in management and administration, accounting, personnel, purchasing, engineering, tool and die making, setup, machine operation, quality assurance, safety, metallurgy, maintenance, and other courses dictated by specific circumstances.

Several additional possibilities of the College/Industry/PEP training program merit consideration. In addition to Government sources such as HEW, Small Business Administration, Labor Department, and Manpower Administration, other possible sources of educational funding are local industry and scholarship funds. Also, Government personnel could be trained along with civilian personnel; e.g., ARRCOM, IBEA, and DCAS personnel. Finally, the College/Industry/PEP training program affords well grounded justification for Government funded jobs as a means to increase industrial employment.

Kingsbury Machine Tool Corporation of Keene, New Hampshire has already placed in operation a comprehensive program closely paralleling the College/Industry/PEP idea. Kingsbury started the program because, in the firm's opinion, society's attitudes on skills had deteriorated so much between the 1940's and the 1960's that vocational technology training was becoming a dumping ground for ambitionless young people. Although the skills were vital, society no longer valued them.

FIGURE VII - 1

SKILLS
POSSIBLE SOLUTION
TRAINING PROGRAMS
COLLEGE/INDUSTRY/PEP



Kingsbury has a conventional employee training program, as well as the one corresponding to the College/Industry/PEP idea. Most of Kingsbury's new employees get started through employment entry programs similar to those found at other companies. These programs last two to five months, depending upon the department involved, and they are keyed to anticipated production requirements.

Kingsbury's "College/Industry/PEP" type training program involves smaller numbers of people but far more comprehensive skills and long-range skill planning than the conventional program. This training involves co-op programs with local high schools and state colleges. The students spend half of each day in class, and the other half-day working at the plant. During the year, each student spends from one to five weeks in each of 16 departments. Performance is graded in each department, and students also receive a letter grade at school. Students' salary increases are based on their grades.

Kingsbury's "College/Industry/PEP" type program has been an outstanding success. Students and the company are pleased with aspects of this program. Since Kingbury keeps track of all co-op graduates, the firm also knows where skills are available. Such a program, however, demands a real commitment from companies and educators who try to revive vocational technology training.

VIII. ENGINEERING DOCUMENTATION

A. GENERAL

Engineering documentation is one of the basic production resources essential for the satisfactory functioning of the munitions metal parts planned item production system and related industrial preparedness planning (IPP). Engineering documentation is used to:

- o Define the required planned item
- o Enable the planned producer to manufacture the item
- o Provide backup to support production assignments for IPP
- o Permit prime contractors and subcontractors to engage in bidding and procurement

Engineering documentation for munitions metal parts production is furnished partially by the Government and partially by the producers.

Government furnished documentation describes the required planned item, approved processes for producing it, and Government furnished equipment. It defines the configuration, dimensions, materials, and inspection and testing requirements of the item. Government furnished documentation includes technical data packages (TDP), descriptions of manufacture (DofM), and documentation for Government furnished industrial production equipment.

Producer generated documentation results from the manufacturing engineering effort of a producer to plan for, or to produce, assigned items. By this means, the technical requirements of Government documentation and the quantity requirements of the DD Form 1519, facilities contract, or current procurement contract, are translated into specific manufacturing information based on that producer's equipment, facilities, processes, and skills. Producer generated documentation includes plant layouts, process descriptions, equipment allocation, tooling data, and more as discussed subsequently.

Engineering documentation was a prime subject of concern during the plant modernization visits by KE/SAI teams under this contract. It not only provided input data needed for modernization planning but

also provided insight into capabilities and problems of producers and the validity of IPP. Engineering documentation aspects of those plant visits are reflected in this section.

Subsections B and C define and discuss the various kinds of Government furnished and producer generated documentation, respectively.

Subsection D discusses configuration management.

B. GOVERNMENT FURNISHED DOCUMENTATION

1. Definition

Government furnished documentation includes:

- o Technical data packages for planned items including:
  - Drawings
  - Specifications
  - Standards
  - Qualified Products Lists
  - Procedures
  - Parts Lists
  - Inspection Equipment Lists
  - Calibration Instructions
  - Manuals
  - Operating Instructions.
- o Descriptions of manufacture for planned items; these include records of materials, processes, operations, tools, equipment, etc., required for initiation of production at some later date.
- o Documentation for Government furnished industrial production equipment.

2. Technical Data Packages

A technical data package (TDP) is a technical description of a planned item and its manufacture, intended for use in procurement, production, and inspection of that item. Each end item and major component of munitions metal parts is covered by a military specification (MIL-SPEC) which lists other key

documents in the TDP, identifies special requirements, and covers quality assurance requirements and packing.

The [illegible] ls are not given. The [illegible] applies to drawing references. A particular end item or major component may have hundreds or even a thousand or more reference drawings and other documents. However, the MIL-SPEC normally identifies only the Technical Data Package List (TDPL) under the heading of "DRAWINGS." The TDPL is the master list of every drawing and every other document in the complete TDP. Documents other than drawings include parts lists, marking diagrams, inspection equipment lists, operating instructions for inspection, qualified products lists (such as for paint and lubricants), and all applicable standards and specifications, including those listed in the MIL-SPEC.

The second area in which the MIL-SPEC for a planned item does not give details concerns the effective dates of its referenced documents. MIL-SPEC users are instructed to use that issue of each reference document in effect on the date of invitation for bids or request for proposal. Some users find this instruction difficult to comply with because they do not realize that document dates and proper revision designations are given in the TDPL and, as a result, they guess at the proper dates and revisions of the referenced documents. This results in occasional use of a superseded revision.

In summary, a complete TDP is the aggregate of all documents referenced by the MIL-SPEC and the TDPL, with revision dates in accordance with the TDPL. The drawings constitute the basic documents of the TDP; the specification is superior in the event of conflict.

When tracking down a TDP for a particular planned item, if the MIL-SPEC number is not known it can be found in the DOD Index of Specifications and Standards, Part I, Alphabetical Listing supplements to this Index are issued bimonthly. The Index must be used carefully, because each item can have more than one MIL-SPEC. For example, there can be separate MIL-SPEC's for a complete metal parts assembly, subassemblies, and the load-assemble-pack operation.

Technical data packages basica[illegible] are of good quality. Problems experienced are more like[illegible] be of an administrative nature such as:

- o Producer not having TDP
- o Wrong document revision obtained or used
- o Occasional microfilm partially illegibl[illegible]articularly a[illegible] the edge.

Up-to-date technical data packages must be available at the planned producer's plant so that meaningful planning can be accomplished. In fact, AR 700-90 instructs the procuring agency to make every effort to ensure that the complete TDP, including current drawings and specifications, is attached to the DD Form 1519 when submitted to the prime contractor, unless the procuring agency is certain that the proposed contractor currently has an updated TDP. DOD 4005.3-M has somewhat similar instructions. Yet, none of the plants visited by the KE/SAI teams receive TDP updates as prescribed by these directives. Some planned producers visited by KE/SAI had no up-to-date TDP's, and the TDP's of the other producers visited were only partially up to date. Furthermore, it is difficult and complicated for producers to get TDP's on a timely basis. Requests for TDP's have to be followed up several times, and frequently the contractor has to contact a number of Government offices to obtain all of the documents referenced in a particular TDP.

Revisions to TDP's should be promptly and automatically forwarded to all planned producers as soon as such revisions become available. Then followup will be required, since KE/SAI trips to planned producers indicated that producers sometimes file TDP revisions without the necessary review and study. TDP revisions may require changes in manufacturing processes. However, if the planned producer does not review the TDP revision or the new TDP, it is not discerned whether or not the production equipment requirements are significantly different from those determined in the original planning. Thus, the validity of the IPP is questionable.

Some producers do have a manufacturing engineer or other delegate charged with responsibility for keeping the documentation updated, but most producers do not. Therefore,

the Government should require feedback from the planned producer upon receipt of TDP revisions to ensure that both the planned producer and the Government are aware of changes in production equipment requirements or in manufacturing conditions that would affect mobilization production.

It is recommended, therefore, that all changes to all technical data, drawings, specifications, etc. be accompanied by a special form for the planned producer to fill out within a specified time and return to the Government. This form should request that the revised technical data be reviewed for any possible effect on the planned producer's ability to produce the planned item, in the planned quantities, and in the planned response time. Further, the form should address itself to production equipment requirements by types and quantities. If additional equipment is required, the specific description and quantities should be given by the planned producer. The effect on subcontracted items or services, if any, should be noted and action should be taken by the planned producer to revise subcontractor planning as required. The planned producer should also identify any anticipated problems. The feedback from the planned producer should include an estimate of the time and cost for updating the production line. Facilities contracts should be modified to require and to fund the above actions by the planned producers.

Proper TDP identification is imperative. KE/SAI modernization teams encountered instances where the item description on a 1519 was ambiguous, (for example: "Booster, M125A1, MPTS"). As a result, an obsolete TDP with the identical item description was used for planning by the producer, and the designated equipment was not capable of producing the required item. The Item Description on DD Form 1519 and in facilities contracts should show not only the model number and the full word description of the item, but also a reference to the TDPL and proper revision. The TDP reference could be the MIL-SPEC number and revision, or the TDPL number and revision, or the assembly drawing and revision.

3. Description of Manufacture

APSA Regulation 715-3 states that a description of manufacture (DofM) is a document containing a concise and orderly arrangement of information that can be readily understood and followed by personnel in establishing manufacturing procedures

and processes for the referenced item. The regulation also requires a DofM to be based on a proven process, shown to be the most advanced, economical and faultless or, in the case of new items, on a sequence of operations which have individually been established as workable production procedures. Further, the DofM must be based on, and include, all of the improved processes that are being instituted and/or contemplated as finalized methods of manufacture. The problem with the last requirement is that additional processes can be approved later without the DofM being updated to include them.

A standard DofM includes:

- Introduction.
- Patent List
- Individual Descriptions of Manufacture Coverage
- Illustration of Planned Item:
  - External
  - Internal (Cross Section) if applicable
- Lists and Bill of Material:
  - Department of Defense Bill of Material for Purchased Parts (DD Form 347)
  - List of Drawings and Illustrations
  - List of Specifications and Tests
  - List of Inspection Equipment
  - Tool List
  - Department of Defense Raw and Semi-Fabricated Stock (Bill of Materials DD Form 346).
- Plant Layout and Summary of Machines and Major Equipment
- Process Flow Chart

- Description of Manufacture

- Drawings, Illustrations

- Summary of Floor Space and Labor Requirements

- Narrative on Problem Areas and Solutions

The purposes of DofM's, according to APSA Reg. No. 715-3, are to:

- Preserve the know-how developed by the successful manufacture of the items involved.

- Provide new contractors with information of potential assistance in getting production lines into operation.

- Assist procurement agencies in evaluating contractor proposals; effecting machinery allocations; obtaining priority assistance on critically needed facilities; integrating production lines, etc.

- Permit complete study of contractors' manufacturing processes by appropriate personnel in Government agencies, for the purpose of developing better and more economical methods of manufacture.

- Provide a means of education and coordinated exchange of ideas between procurement agency personnel, and between established and new contractors engaged for manufacture of identical items.

MUCOM Reg. No. 715-24 suggests that an additional purpose of DofM's is:

- To serve as a record of materials, processes. operations, tools, equipment, etc. required for initiation of production at some later date.

DofM's could be referenced in technical data packages but are not, according to ARRCOM personnel, because the Government does not dictate the process. The existence of DofM's, or lack thereof, is indicated on AMSAR Form FL-232, but that form only goes to ARRCOM Quality Assurance, so it does not serve as a

general notice that the DofM exists. (Telecon 12/28/76; J. Jordan, ARRCOM/AMSAR, and L. Hurwitz, KE).

The KE/SAI modernization teams reported only rare instances where producers had ever received a DofM to assist in mobilization planning or startup of a PEP line. This is consistent with the disclosure in a meeting on 28 Sept. 1976 with John Krohn of DRSAR-PPC that ARRCOM receives many proposals to prepare DofM's, but that the Army has not been buying them for approximately the past ten years because of their high cost.

4. Equipment Documentation Furnished by Government

Government documentation for IPE is inconsistent. When a producer receives IPE from the Government, sometimes complete documentation will be received, including handbooks for the equipment, instruction manuals, drawings of the equipment, wiring diagrams, parts lists, maintenance instructions, maintenance records, etc. More frequently, however, equipment is received with incomplete documentation. This highlights a problem area identified by this study. If the equipment had previously been on loan to a PEP producer, then that producer should have put all pertinent documentation with the equipment when it left the plant. when it left the plant. However, having done so, the producer should have been paid for the effort, and the authorities responsible for Government property should have verified that these records were kept with the equipment. It is concluded that these responsibilities should be covered in the "PEP Manual" which is recommended in this report. Also, it is recommended that the facilities contract be used as the instrument for requiring that PEP producers provide, update, and maintain the documentation defined above for PEP equipment, and for reimbursing the producers for this service.

C. PRODUCER GENERATED DOCUMENTATION

1. Definition

Producer generated documentation includes:

- Process descriptions
- Equipment requirements

- Plant and equipment layouts
- Tooling documentation
- Quality assurance documentation
- Production control documentation
- Equipment maintenance manuals and records
- Bills of material
- Subcontract documentation for raw material procurement and piece parts
- Equipment documentation
- Historical documentation
- Other producer generated documentation such as that for facility management and maintenance.

These various types of producer generated documentation are discussed in the following paragraphs.

2. Process Descriptions

Process descriptions, descriptions of operations, operations sheets, method sheets, or process sheets--whatever the individual producer chooses to call them--these engineering documents all identify the processes to be used by the producer. They are the basic engineering documents generated by the producer to show how the item described by the TDP will be manufactured by that producer. They usually include a narrative description of the operation in sequential steps and indicate the output rates per hour. In some cases they indicate tooling, or they may refer to separate sheets of standard tooling instructions.

These process descriptions should accompany the PEP package to layaway so that they will be available without delay when the PEP is reactivated. As in the case of equipment documentation, the facilities contract should be used as the vehicle for requiring that the contractor include these documents in the layaway package. The contractor's costs should be reimbursed

under the facilities contract; however, these costs should be minimal because the documents would have been prepared under a supply contract, or as part of IPP.

3. Equipment Requirements

An equipment requirements list or package describes the type, quantity, and production rate capability of equipment required for each operation in the process description. It also indicates which equipment the producer will provide, which is GFE already assigned to the producer, and which voids need to be filled by other GFE. Sometimes the equipment requirements will be included wholly or partially on operations sheets.

The equipment requirements should also include special facilities requirements of the equipment. These would include requirements for utilities, effluent control, environmental limitations, and special supports or foundations. Determining the adequacy of the plant to provide for these various facilities requirements should be an integral part of IPP.

4. Plant and Equipment Layouts

Equipment layout drawings reveal whether or not the producer's present plant has adequate floor space to accommodate all of the equipment for production of all planned items assigned to that producer. Equipment layouts also provide a measure of the quality of the producer's manufacturing engineering. Study of the layouts will show whether the equipment is grouped for continuous line production or batch production. It will also show whether material flow is practical for concurrent production of all assigned planned items. Special foundations, auxiliary components such as separate control cabinets, inspection stations, surge bins, raw material stockpiles, toolroom, power transformers, switchgear, compressor stations, and all other significant space requirements, should be shown on equipment layouts to show that there is adequate space for production.

5. Tooling Documentation

Tooling documentation is needed to back up IPP because lack of tooling can seriously delay startup. This documentation includes tooling design, tooling drawings, setup sheets, and also subcontractor or source data for tooling procurement. It

also includes N/C programs where CAD/CAM techniques are used for manufacturing tooling.

6. <u>Quality Assurance Documentation</u>

A contractor must have an approved quality program in accordance with ASPR 14, "Procurement Quality Assurance," MIL-I-45208, "Inspection System Requirement," MIL-Q-9858, "Quality Program Requirement," and the supplementing regulations, before starting production of munitions items under a supply contract. The contractor is required to maintain, and furnish when requested, substantiating evidence of product conformance to quality requirements.

Quality assurance (QA) documentation is required for both in-process and final acceptance inspection. It includes the QA program manual, inspection procedures, inspection equipment lists, calibration data sheets for checking gages or test equipment, laboratory reports, procedures and forms for disposition of non-conforming materials, inspection records and acceptance sign-off sheets.

Drawings of jigs, fixtures and equipment setups for inspection are included in the TDP. The producer may elect to work solely from the TDP or to prepare supplementary documentation for inspection. Intermediate tolerances frequently are tightened to lower reject rates at formal inspection points.

Quality assurance documentation is found to be the most consistently satisfactory of all documentation generated at producers' plants. Recommendations for improvement are not considered to be necessary.

7. <u>Production Control Documentation</u>

Documentation, such as the TDP and process description which provides the basis of manufacture must be complemented by production control documentation for control of manufacturing. Production control documentation may include routing sheets, production schedules and assignments, quality control signoff sheets, cost control records, and other management control documents. Together with the control system procedures and the organization, it constitutes the overall production control system.

The evaluation of a potential planned producer's capabilities should include a review of the production control system. First, the review should establish that the producer actually has a formalized system. Secondly, the capabilities of the system should be measured against the complexity of the mobilization production assignments.

8. Maintenance Documentation

Maintenance documentation falls into two basic types, normal maintenance program manuals and equipment maintenance records. Facilities contracts require that, shortly after execution of the contract, the producer submit in writing a proposed normal maintenance program. This must include a schedule for preventive maintenance and describe the maintenance records system.

When agreement has been reached with the Government, the contractor is obligated to follow the program, perform normal maintenance of equipment, and maintain maintenance records. This is all at no additional cost to the Government over the estimated cost in the facilities contract.

It was noted during the plant modernization visits that the equipment maintenance records were not always available, and those examined were not of consistently high quality. Therefore, it is recommended that the annual review of the contractor's capabilities include an audit of the equipment maintenance records. The purpose of this audit should be to verify that the approved program is being followed and that the equipment maintenance records are up to date, intelligible, and sufficient to disclose the maintenance actions performed, deficiencies discovered as a result of inspections, and the action taken toward correcting the deficiencies. The action would consist of either correcting minor deficiencies as part of normal maintenance, or advising the Contracting Officer in writing if the work is in excess of normal maintenance obligations, and including an estimate of cost for the work.

9. Subcontract Documentation

The Government should review subcontract documentation with two objectives. The first objective is to verify the prime contractor's preparedness planning and, thus, readiness posture. The other objective is to verify that the planned

subcontractor's capabilities will not be exceeded when a number of planned producers are supplied. To accomplish this second objective, the results of the subcontract documentation review should be an input into the resource management system described in Section X.

When a raw material vendor or piece part manufacturer is a supplier to only one prime contractor for munitions metal parts, the source should be a subcontractor and all of the documentation should be handled directly by or through the prime contractor. Documentation would include DD 1519's, documentation for PEP equipment needed by the subcontractor, technical process information needed by the subcontractor for manufacturing the product, etc. In this case of a supplier to a single prime contractor, the Government would only need a facilities contract with the prime contractor.

In the alternate situation, the firm is a supplier to more than one prime contractor; thus, the Government should handle all preparedness planning, contracting, and related documentation directly with that firm. The Government should enter into a facilities contract with the supplier. These actions will enable the Government to verify that the supplier's total capabilities will not be exceeded when all of the requirements of the planned producers who are dependent on that supplier are considered collectively. The Government agency to whom this responsibility is assigned should be authorized to function in all parts of the country where the various planned producers to be supplied are located, and not be limited by geographical boundaries.

In the case of an extremely critical raw material, the concept of direct Government handling and a separate facilities contract should be used even if the firm supplies a single planned producer.

10. Equipment Documentation

Equipment documentation is important for all machines, but it is especially important for the more complex machines or for a machine which has been irreversibly modified for production of a specific item. Without proper documentation, future users will be unaware of the modification and will be misled as to the machine's capabilities. Inconsistency in the adequacy of

documentation received with Government IPE at a producer's plant was noted in Section VIII.B.4.

Facilities contracts are not specific about equipment documentation requirements. They do require the contractor to prepare DD Form 1342 "DOD Property Record" for each piece of equipment, and DD Form 1342 does list the following questions:

"36. Are installation instructions available for transfer?

"37. Are operating instructions available for transfer?"

However, what is needed is a comprehensive listing in the facilities contract of all equipment documentation that should be provided, and a comprehensive listing accompanying the DD Form 1342 of all equipment documentation that is actually available.

AR 700-43, Defense Industrial Plant Equipment Center Operations (DSAM 4215.1), has a section (20203) called "Historical Records." It requires that, for each piece of equipment reportable to DIPEC, a historical record or group of records must be established and maintained and must accompany the equipment on transfer. The historical record should include:

- DD Form 1342's for receipt of equipment, changes, equipment no longer needed, and completion of disposal
- Packing list describing the basic item and all accessories and auxiliaries (DD Form 1342 may be adequate)
- Inspection and test records, reports, and forms
- Work orders and maintenance expenditures
- Cost estimates of repair or rebuild
- Purchase order, purchase description, and receiving reports
- Shipping instruction, shipping document, and damage or shortage reports
- Technical data:

- Operating and installation instructions

- Diagrams of electrical and hydraulic systems and utility connections

- Photographs, manuals, and other manufacturer's literature

- Machine parts lists

- Lubricating charts.

Some producers visited by KE/SAI teams kept excellent records on IPE. The records included cards and tags for each machine, machine drawings, spare parts lists, instruction manuals, etc. Some of the producers kept such records only on Government IPE and had essentially no documentation on private equipment. All producers should be encouraged to acquire and maintain such records for both Government IPE and private IPE. This can be accomplished by specifically stating the requirement in a special clause of the facilities contract, and either listing the required documentation as above, or specifically referencing Section 20203 of AR 700-43.

11. Other Producer Generated Documentation

Other types of producer generated documentation include provisions for facility management and maintenance; data and drawings on available utilities and on totals required for mobilization; plans for changeover from civilian products to mobilization; and skills requirements, manpower projections, and skills acquisition plans. Facilities, utilities, and civilian change-over plans are beyond the scope of this study; skills are discussed in Section VII.

12. IPP and Producer Generated Documentation

Producer generated documentation collectively constitutes the backup needed for dependable IPP. Frequently, however, it is found to be inadequate to support IPP. At some plants it is outdated, and often may be several years old. For some of the producers visited in the modernization program, the engineering documentation supposedly supporting IPP consists of nothing more than information previously submitted in support of bids, or documentation from planning and scheduling of old production

operations. The documentation is particularly poor where the plant has not produced a specific planned item for a number of years. As a general rule, the more recently a product has been produced, the more likely it is that engineering documentation for that product is available and complete.

Presently, a number of producers appear to give only superficial attention to mobilization planning. With funding of IPP included in their facilities contracts, producers should be more willing to generate the documentation needed for thorough advance planning.

Documentation to back up IPP should include:

- Identification of processes to be utilized
- Step-by-step description of production operations or sketches and drawings
- Description of equipment and accessories required for each production operation
- Identification of the required production equipment available at the planned producer's plant
- Description of the required production equipment which must be provided by the Government
- Flow diagram of the workpieces through the production line
- General plant layout showing equipment
- Estimate of total energy and utility requirements for full mobilization production
- List of available utilities, and capacities of each, for compressed air, steam, electricity, gas, water, sewage, etc.
- Estimated production rates per machine per operation per product line
- Raw material requirements
- Purchased piece part requirements

- Statement of outstanding OSHA problems
- Statement of outstanding environmental problems
- QA program as required by facilities contract
- Plan of action to accomplish changeover from civilian products, and to start up mobilization production, including plans for:
  - Acquisition of equipment
  - Installation of equipment
  - Design of tooling
  - Acquisition of tooling
  - Acquisition of raw materials
  - Acquisition of subcontractors
  - Explosive storage and handling (fuzes only)
  - Personnel/skill requirements and program for acquisition.

Required producer documentation should be prescribed to at least this level of detail in the facilities contracts.

D. CONFIGURATION MANAGEMENT

A program as large and complex as the PEP Modernization Program presents many possibilities for potential cost growth and interface problems. To obviate such difficulties in large DOD programs, the discipline of configuration management has been developed. Configuration management, according to DOD Directive 5010.19 and MIL-STD-480, applies technical and administrative direction and surveillance to;

- Identify and document the functional and physical characteristics which constitute the configuration of hardware, software, or a system.
- Control changes to those characteristics.

- Record and report on the status of the processing and implementing of the changes.

Configuration control, which is the second item above, consists of the systematic evaluation, approval or disapproval, coordination and implementation of all approved changes in configuration.

Configuration management and configuration control for PEP modernization should provide the following:

- Apply basic configuration management concepts of identification, control, accounting, and audit to PEP production systems, PEP equipment, and to the development of PEP management systems.

- Latitude in criteria development and design up to a "freeze" point.

- Early establishment of configuration baselines.

- Changes permitted only for the following reasons:

  - Safety

  - Significant advance in the state of the art

  - Significant design improvement

  - Correction of operational deficiencies

  - Pollution abatement

  - Major cost reduction--value engineering.

- Thorough evaluation of the impact of each proposed change.

- Timely incorporation of approved changes.

- Standardization of design and configuration management from site to site.

- Minimum impact on existing modernization and expansion programs.

- No need for formal configuration management experience.

PBM has prescribed a program which provides the various features in the preceding list. That program is prescribed in PBM OSM 70-1, "Configuration Management Operating System Manual," dated 1 April 1976, issued by Office of the Project Manager for Munitions Production Base Modernization and Expansion, Dover, New Jersey, as a branch of the U.S. Army Materiel Development and Readiness Command. PBM OSM 70-1 incorporates applicable features of the various DOD regulations listed below, and adapts them specifically to the Munitions Production Base Modernization and Expansion Program. PBM OSM 70-1 should be followed faithfully in order to realize maximum benefit from PEP modernization.

Basic DOD configuration management/control standards are:

- DODD 5010.19, Configuration Management, 17 July 1968.

- MIL-STD-480, "Military Standard, Configuration Control - Engineering Changes, Deviations and Waivers," 30 October 1968, Department of Defense.

- MIL-STD-481A, "Military Standard, Configuration Control - Engineering Changes, Deviations and Waivers (Short Form)." 18 October 1972, Department of Defense.

- MIL-STD-483 (USAF), "Military Standard, Configuration Management Practices for Systems, Equipment, Munitions, and Computer Programs," 31 December 1970, Department of the Air Force.

IX. DIRECTIVES

A. GENERAL

1. Purpose

The body of Government directives that authorize and implement the PEP program is evaluated in this section. These data, as listed in Table IX-1, comprise 37 documents selected by DARCOM on the basis of particular relevance to PEP's.

Four categories of directives were identified:

(1) Authorizing
(2) Managing (direct)
(3) Managing (associated)
(4) Working data

These documents were examined to determine their general interrelationships and to identify those points of conflict (i.e., contradictory provisions) that could induce difficulty in managing PEP's. Section IV.B discusses a number of the documents from the viewpoint of their statutory relation to production resources.

2. Summary of Findings

a. The directives provide adequate authorization and direction for accomplishment of the objectives of the PEP program.

b. The directives assume that sufficient resources and funding are available to achieve the objectives of the PEP program.

c. Policies and procedures governing the PEP program are fragmented among many directives, including a number with subject titles not clearly related to PEP or IPP.

d. Personnel responsible for implementing policies and procedures related to PEP or IPP do not hold all pertinent directives and have difficulty in obtaining some relevant directives.

TABLE IX-1

DIRECTIVES REVIEWED*

ITEM	GOV'T DIRECTIVE	TITLE
	(Authorizing)	
1	H.R. 9286/P.O. 93-155	Defense Industrial Reserve Act
2	DODI 4215.1	Plant Equipment Retention and Maintenance
3	ASPR, Sect. XIII	Government Property
	(Direct Management)	
4	AR 700-90	ARMY Industrial Preparedness Program
5	AR 700-43	Defense Industrial Plant Equipment Center Operations
6	DODD 4005.1	DOD Industrial Preparedness Production Planning
7	DODI 4005.3	Industrial Preparedness Production Planning Procedures
	(Associated Management)	
8	ASPR, Appendix B	Government Property in Possession of Contractors
9	ASPR, Supplement No. 3	Property Administration
10	DOD 4005.3-M	Industrial Mobilization Production Planning Manual
11	DSAM 4005.1	Industrial Preparedness Planning Manual

*In concurrence with DARCOM letter DRCRP-IF to J. S. Ritchie, dated 12 March 1976; see Appendix.

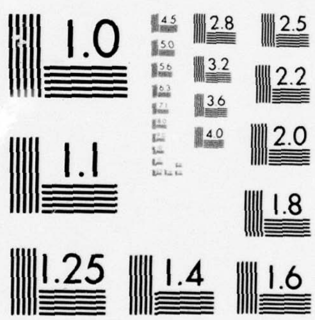
AD-A039 561 KAISER ENGINEERS OAKLAND CALIF F/G 15/5
PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM. VOLUME 9. --ETC(U)
MAY 77 DAAA21-75-C-0303

UNCLASSIFIED 75-86-R-9 NL

4 OF 5
AD
A039561

END
CONT'D

DATE
FILMED
6-77



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

TABLE IX-1

ITEM	GOV'T DIRECTIVE	TITLE
	(Associated Management, Cont)	
12	DOD 4005.3H	Register of Planned Emergency Producers (3 Vols.)
13	DODD 4275.5	Industrial Facility Expansion and Replacement
14	DODD 4215.18	Management of Defense-Owned Industrial Plant Equipment (IPE)
15	MIL-STD-107E	Preparation and Handling of IPE for Shipment and Storage
16	DODI 4215.14	Replacement of Industrial Plant Equipment
17	DODI 4145.19	Storage and Warehousing Facilities
18	DODI 4155.4	Inspection and Reporting of Departmental Industrial and National Industrial Plant Reserve
19	TM 38-2600	Preparation and Inspection of Industrial Production Equipment for Storage or Shipment
20	AR 37-100-FY	The Army Accounting Classification Structure (Fiscal Code)
21	AR 71-6	Type Classification/Reclassification of Army Materiel
22	DA PAM 700-23	Replacement of Industrial Plant Equipment in Production Base Support Program

TABLE IX-1

ITEM	GOV'T DIRECTIVE	TITLE
23	DODI 7041.3	Economic Analysis of Proposed DOD Investments
	(Working Data)	
24	DOD FORM 1519	DOD Industrial Preparedness Program Production Planning Schedule
25	RCS:DD-I&L(A)1201	Industrial Preparedness Planning List (IPPL)
26	FORMAT A	Plant Equipment Packages Fact Sheet
27	FORMAT B	UNTITLED (Certification of PEPs' Compliance with Criteria for Retention)
28	FORMAT C	Report of Discontinuance of Plant Equipment Package
29	RCS:DD-I&L(SA)784	Cost of Maintenance of the Industrial Mobilization Base
30	AR 700-90, Fig. 5-7	PEP Change Notice
31	RCS:DD-I&L(A)642	Management of Defense-Owned Industrial Plant Equipment Package (PEP) Status Report (DA Form 3553-R)
32	RCS:CSCRD-166	Layaway and/or Redistribution Project (Exhibit P-17)
33	RCS:CSCRD-163	Production Base Plan (PBP)
34	DD FORM 770	Inter-Departmental Request for Release of Equipment Assigned to PEPs

TABLE IX-1

ITEM	GOV'T DIRECTIVE	TITLE
35	RCS:DD-I&L(A)1272	Departmental Industrial Plant Reserve (DIPR); National Industrial Plant Reserve(NIPR) and Reserve Commercially Acquired Plant (RECAP) Reports
36	SP5, SP6	DIPEC Computer Listings
37	AR 37-40	Army Production Base Support Program Report RCS CSGLD-1123(R1) (MIN)

e. The definition of many relevant terms is not consistent throughout the directives.

B. PEP STATUTORY BASIS

The statutory basis of the PEP program is the Defense Industrial Reserve Act (H.R. 9286/P.L. 93-155, Section IV) which discusses the purpose and policy of this act as pertinent to PEP's.

This act provides adequate authorization and direction for accomplishment of PEP purpose with one exception; i.e., it directs reliance to the maximum extent practicable on private industry for the support of defense production without making explicit provisions for ensuring commitment of private industry to such support. Further, the statutory basis for PEP's is interpreted by implementing directives in such a way that, by and large, PEP's do not "...maintain a high state of readiness for production of critical items of defense material" (P.L. 93-155). For example, statutory definition of PEP's is interpreted by the implementing directives to mean retention of only Government-owned machine tools and other industrial manufacturing equipment. Thus, the primary orientation is to the equipment needs of a particular planned producer, resulting in a "tailored" PEP that, if assigned to another producer, would not necessarily be capable of producing the desired planned item.

C. DIRECTIVES

The directives reviewed include both authorizing directives and implementing directives. The Secretary of Defense, or his designated subordinate, issues authorizing documents as DOD Directives (DODD's), DOD Instructions (DODI's), and Armed Service Procurement Regulations (ASPR's). The various DOD components and their subordinate activities originate implementing directives, such as Army regulations, pamphlets, computer listings, or DOD forms and reports.

These directives reflect the overall policy of the Defense Industrial Reserve Act. They prescribe planning to minimize the number of Government-owned plants, the Government's industrial reserve of machine tools and other manufacturing equipment (Line Item 6, Table IX-1), and they establish responsibilities and procedures for disposition of Government-owned plants (Line Item 18, Table IX-1) and IPE (Line Item 14, Table IX-1) in excess of minimum requirements for immediate use in a national emergency. The directives emphasize maximum reliance upon private industry for support of defense

production (Line Item 6, Table IX-1). They establish responsibilities and procedures for retention of machine tools and other industrial manufacturing equipment in PEP's and in a general reserve (Line Item 2, Table IX-1). The directives identify and apply funding sources to be used in financing the various activities of the PEP system (Line Items 4 and 20, Table IX-1). (The Line Items cited are typical.)

1. <u>Relation to PEP Program</u>

PEP policies, procedures, and responsibilities are inserted in various sections of the directives governing other, more comprehensive activities such as the Army Industrial Preparedness Program (AIPP). Consequently, a fully integrated view of the overall PEP program (or, for that matter, its salient subordinate activities) can be achieved only by intensive research. If the user of this information is not fully aware of the sources prescribing policy and procedure, this fragmented approach has, as a principal drawback, the following:

- o Very simply, the user cannot be certain that he has "touched all of the bases."

Moreover, among this plethora of documents bearing varying publication dates, the question of governing authority is significant. Such matters as tracing the rescinding, partial or complete supercession, or change of interpretation, of particular provisions tends to force the user to a selective application of more familiar documents, especially if there are time constraints. The associated risk is the possible compromise of the intent of reference selection. In addition, difficulties could arise during the negotiation or execution of a contract action.

Other pertinent difficulties are cited in the following paragraphs.

2. <u>Availability</u>

Paragraph 3-35 of AR 310-2 prescribes that publications and blank forms required by commercial organizations in preparation of bids for, or in execution of, an Army contract will be furnished by the contracting officer. However, some of the directives listed in Table IX-1 were difficult to obtain. A superseded copy of Line Item 10 was finally located in the

University of California Library and after some delay, the Naval Publications and Forms Center provided Line Item 23. Line Item 17 could not be secured from any source.

Such difficulty in obtaining needed documents suggests that the existence of directives does not necessarily guarantee the response prescribed by them, if they are not readily available to the appropriate users.

3. <u>Assumptions</u>

Some directives incorporate assumptions which may preclude or impair early industrial mobilization response during or in anticipation of an emergency.

a. Paragraph V.B of DODI 4215.1 (Line Item 2, Table IX-1) states:

> "<u>Retention</u>. Retained PE will be appropriately identified and the IPE portion reported to the Defense Industrial Plant Equipment Center (DIPEC) using the appropriate status code shown in AR 700-43 to indicate the basis for retention. (Line Item 5, Table IX-1)
>
> "Retained IPE will be reviewed every year by the responsible DOD Component to determine if current and mobilization requirements continue to warrant retention and that it continues to meet the criteria set forth in Enclosure 1. In the event that these conditions no longer exist, the IPE will be reported to DIPEC for disposition instructions."

Reading this statement of retention policy gives the impression that only the IPE portion of Government-owned plant equipment (PE) assigned to PEP's is of management concern.

b. Paragraph V.C of DODI 4215.1 states:

> "<u>Maintenance</u>. DOD Components will establish maintenance programs to insure all PE is properly maintained and that equipment is in operating condition to satisfactorily perform the operation for which it is intended."

This statement of maintenance policy seems to assume that cognizant agencies will always have sufficient budget and manpower to perform or direct the maintenance program. This example is representative of other apparent assumptions throughout the directive system that funding and spending authority is vested in commensurate amounts in the hands of those with IPP responsibility.

c. Paragraph 2-9 of AR 700-90 (Line Item 4, Table IX-1) states:

> "General. IPP is conducted to plan the efficient use of existing commercial facilities to meet the materiel production and maintenance requirements of the Army in the event of an emergency. Production and/or maintenance capacity of civilian industry will be allocated by a signed DD Form 1519 (DOD Industrial Preparedness Program Production Planning Schedule)."

This statement of the purpose of IPP implicitly assumes that DD Form 1519 (Line Item 24, Table IX-1) can be used as an adequate basis of information for planning efficient use of existing commercial facilities via IPP. This example is representative of other assumptions throughout the directive system that DD Form 1519 is a viable instrument for allocating production and/or maintenance capacity of the private sector.

D. DEFINITIONS

Most of the directives include definitions of various common terms relevant to PEP's and PEP IPP. This study has addressed definitions as a topic because clear and consistent definition of common terms is essential for understanding the directives and implementing them. Omission or confusion of these definitions degrades and even denies such understanding and implementation. Table IX-2 (end of Section) presents a comparison of the definitions of several significant terms as provided in different key directives.

Several definitions of terms in the directives include contradictions. Consider Paragraphs IV.B, IV.D, and VI.F of DODI 4215.1 (Line Item 2, Table IX-1) which state:

"IV.B. Plant Equipment (PE) - Means personal property of a capital nature (consisting of equipment, machine tools,

test equipment, furniture, vehicles, and accessory and auxiliary items, but excluding special tooling and special test equipment) used or capable of use in the manufacture of supplies or in the performance of services or for any administrative or general plant purpose.

1. Special Test Equipment - Electrical, electronic, hydraulic, pneumatic, mechanical or other items or assemblies of equipment, which are of such a specialized nature that, without modification or alteration, the use of such items (if they are to be used separately) or assemblies is limited to testing in the development or production of particular services. The term 'special test equipment' includes all components or any assemblies of such equipment but does not include, consumable property, special tooling, buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special test equipment), general or special machine tools, or similar capital items.

2. Special Tooling - All jigs, dies, fixtures, molds, patterns, taps, gauges, other equipment and manufacturing aids, and replacements thereof, which are of such a specialized nature that, without substantial modification or alteration, their use is limited to the development or production of particular supplies or parts thereof, or the performance of particular services. The term includes all components of such items, but does not include consumable property, special test equipment, buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special tooling), general or special machine tools, or similar capital items."

"IV.D. Plant Equipment Package (PEP) - A complement of active and/or idle plant equipment (B., above) which has been formally approved for retention by the Assistant Secretary of Defense (Installations and Logistics) in accordance with criteria and procedures set forth herein."

"IV.F. All PEPs will be complete and <u>will</u>, insofar as practical, have <u>special tooling</u> and supporting equipment necessary to enable them to produce the items for which they are being retained except those in the process of assembly and given a "conditional" ASD (I&L) approval as subsequently described herein."

Paragraph VI.F of DODI 4215.1 contradicts Paragraph IV.B and IV.D of the same directive by specifically including "Special Tooling" (Line Item 17, Table IX-2) in PEP's while the other two paragraphs exclude "Special Tooling" from "Plant Equipment" (Line Item 7, Table IX-2) and, therefore, from PEP's (Line Item 1, Table IX-2).

The definition of a term in the various directives is not consistent. For example, refer to the definitions of "plant equipment package (PEP) and "idle IPE" listed in Line Items 1 through 5 and 26 through 30, Table IX-2. Table IX-2 also indicates that many important terms defined in authorizing directives are not defined in implementing directives, even though the authorizing directives are not distributed to implementing personnel. For instance the PEP is defined directly in terms of PE, ST, STE and IPE in the DOD instruction (DODI 4215.1) authorizing PEP's at the Department of Defense (DOD) level, but PE, ST and STE are defined in only one or two implementing directives.

The directives omit some definitions essential to understanding of the directives or refer to them by acronym only. Typically, a definition of "other plant equipment (OPE)" could be found only in TM 38-260 (Line Item 18, Table IX-1); "Government-furnished equipment (GFE)" was not defined in any of the directives listed in Table IX-1.

(AR 700-90 expressly references AR 310-25, "Dictionary of United States Army Terms," for AIPP; however, this study indicates that terms requiring definition are often missing from the dictionary).

E. <u>INTERRELATIONSHIP OF DIRECTIVES</u>

Table IX-3 (end of Section) illustrates the interrelation of the directives listed in Table IX-1 (column labeled "References"), and indicates the authority (ies) under which the documents were issued. In practical terms, the order of precedence would be authorization guides implementation. That is, the higher the order (cf. P.L. 93-155), the more general the content: broad statements of intent,

purpose, policy, or constraint; i.e., authorization. Then, the implementing directives are developed to provide for specified action within authorized boundaries.

The body of documents whose evaluation is reported here reflects these characteristics. Many of them have a common source of direction or authorization, share a common purpose or function, and may also possess common cross-references.

Herein lies one of the difficulties associated with using these documents. For a particular task, the complete instructions for its effective performance may be distributed among a number of directives, no one of which is in itself definitive. As promulgation of directives, and their associated distribution, follows clearly defined chains of command, a lower echelon may not receive information crucial to the performance of task assignments...by virtue of the echelon's absence from the distribution list.

As noted in Subsection IX.C, this fragmentation impedes the transmission of clear-cut instructions to the operation echelons. Typical of this is DOD 4005.3-M, "Industrial Mobilization Production Planning Manual"; portions of its contents have been supplemented as follows:

(1) Detailed instructions for preparation and submission of DD Form 1519; expanded by AR 700-90.

(2) "DSA Procuring Activities"; addition of "Specific Functions and Responsibilities" in DSAM 4005.1.

TABLE IX-2

COMPARISON OF DEFINITIONS

ITEM	TERM	DEFINITION	DIRECTIVE
1	Plant Equipment Package (PEP)	A complement of active and idle machine tools and other industrial manufacturing equipment held by and under the control of the Department of Defense and approved by the Secretary (of Defense) for retention to produce particular defense materiel or defense supporting items at a specific level of output in the event of emergency.	H.R. 9286/Public Law 93-155, Sec. 809
2	PEP	A complement of active and/or idle plant equipment which has been formally approved for retention by the Assistant Secretary of Defense (Installations and Logistics) in accordance with criteria and procedures set forth herein.	DODI 4215.1
3	PEP	A complement of active and/or idle plant equipment which conforms with the criteria established in AR 700-43 and is formally retained by the ASA (I&L).	AR 700-90
4	PEP	A complement of active and/or idle plant equipment which has been formally approved for retention by the Assistant Secretary of Defense (Installations and Logistics) in accordance with criteria and procedures set forth in DODI 4215.1.	AR 700-43
5	PEP	A complement of active and/or idle plant equipment which has been approved formally by the ASD (I&L) (See DODI 4215.1).	DODD 4215.18
6	Plant Equipment (PE)	Not Defined	H.R. 9286/Public Law 93-155, Sec. 8

TABLE IX-2 (Cont)

ITEM	TERM	DEFINITION	DIRECTIVE
7	PE	Personal property of a capital nature (consisting of equipment, machine tools, test equipment, furniture, vehicles, and accessory and auxiliary items, but excluding special tooling and special test equipment) used or capable of use in the manufacture of supplies or in the performance of services or for any administrative or general plant purpose.	DODI 4215.1
8	PE	Not Defined	AR 700-90
9	PE	Not Defined	AR 700-43
10	PE	Not Defined	DODI 4215.18
11	Special Test Equipment (STE)	Not Defined	H.R. 9286/Public Law 93-155, Sec. 8
12	STE	Electrical, electronic, hydraulic, pneumatic, mechanical or other items or assemblies of equipment, which are of such a specialized nature that, without modification or alteration, the use of such items (if they are to be used separately) or assemblies is limited to testing in the development or production of particular services. The term "special test equipment" includes all components or any assemblies of such equipment but does not include, consumable property, special tooling, or buildings, non-severable structures (except foundations and similar improvements necessary for the installation of special test equipment), general or special machine tools, or similar capital items.	DODI 4215.1
13	STE	Identical to that of DODI 4215.1	AR 700-90

TABLE IX-2 (Cont)

ITEM	TERM	DEFINITION	DIRECTIVE
14	STE	Not Defined	AR 700-43
15	STE	Not Defined	DODD 4215.18
16	Special Tooling (ST)	Not Defined	H.R. 9286/Public Law 93-155, Sec. 8
17	ST	All jigs, dies, fixtures, molds, patterns, taps, gauges, other equipment and manufacturing aids, and replacements thereof, which are of such a specialized nature that, without substantial modification or alteration, their use is limited to the development or production of particular supplies or parts thereof, or the performance of particular services. The term includes all components of such items, but does not include, consumable property, special test equipment, or buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special tooling), general or special machine tools, or similar capital items.	DODI 4215.1
18	ST	Identical to that of DODI 4215.1 (except "alteration" in one is pluralized in the other).	AR 700-90
19	ST	Not Defined	AR 700-43
20	ST	Not Defined	DODD 4215.18
21	Industrial Plant Equipment (IPE)	Not Defined	H.R. 9286/Public Law 93-155 Sec. 8

TABLE IX-2 (Cont)

ITEM	TERM	DEFINITION	DIRECTIVE
22	IPE	Is that part of plant equipment (as defined in this table) with an acquisition cost of $1,000 or more, used for the purpose of cutting, abrading, grinding, shaping, forming, joining, testing, measuring, heating, treating, or otherwise altering the physical, electrical or chemical properties of materials, components, or end items entailed in manufacturing, maintenance, supply, processing, assembly or research and development operations; and IPE is further identified by noun name in Joint DOD Handbooks listed in the Armed Services Procurement Regulations.	DODI 4215.1
23	IPE	Plant equipment with an acquisition cost of $1,000 or more used for the purpose of cutting, abrading, grinding, shaping, forming, joining, testing, measuring, heating, treating, or otherwise altering the physical, electrical or chemical properties of materials, components or end items, entailed in manufacturing, maintenance, supply, processing, assembly, or research and development operations. IPE is identified by noun name in Joint DOD Handbooks as listed in ASPR and in DSA 4215 series IPE handbooks and AR 700-43.	AR 700-90
24	IPE	Same as that for DODI 4215.1 and AR 700-90	AR 700-43
25	IPE	Same as that for DODI 4215.1 and AR 700-90	DODD 4215.18
26	Idle IPE	Not Defined	H.R. 9286/Public Law 93-155, Sec. 8

TABLE IX-2 (Cont)

ITEM	TERM	DEFINITION	DIRECTIVE
27	Idle IPE	Government-owned IPE in contractors' plants, or in activities or installations, which is not being used for the purpose for which it was provided or authorized.	DODI 4215.1
28	Idle IPE	Government-owned IPE in contractor or military facilities which is no longer required for the purpose for which it was originally authorized and provided.	AR 700-90
29	Idle IPE	DOD-owned equipment (in contractor's plants, in military installations or activities, or in supply system stocks) which meets all the criteria for IPE, is excess to contractual or mission requirements and is available to DSA for the General Reserve, for the National Inventory Equipment Reserve (NIER), for redistribution, or for reporting to the General Services Administration (GSA) for other Federal agency screening.	AR 700-43
30	Idle IPE	DOD-owned equipment (in contractors' plants, in military installations or activities, or in supply system stocks) which meets all the criteria for IPE, is excess to contractual or mission requirements and is available to DSA for the General Reserve, for redistribution, or for reporting to GSA for other Federal agency screening.	DODD 4215.18
31	OPE	Not Defined	H.R. 9286/Public Law 93-155, Sec. 8

TABLE IX-2 (Cont)

ITEM	TERM	DEFINITION	DIRECTIVE
32	OPE	Not Defined	DODI 4215.1
33	OPE	Other plant equipment	AR 700-90
34	OPE	Not Defined	AR 700-43
35	OPE	Not Defined	DODD 4215.18
36	GFE	Not Defined	H.R. 9286/Public Law 93-155, Sec. 8
37	GFE	Not Defined	DODI 4215.1
38	GFE	Not Defined	AR 700-90
39	GFE	Not Defined	AR 700-43
40	GFE	Not Defined	DODD-4215.18

TABLE IX-3

INTERRELATIONSHIP OF DIRECTIVES

ITEM	GOV'T DIRECTIVE	DIRECTION/AUTHORIZATION	REFERENCES*
1	H.R. 9286/P.L. 93-155	Congress	National Industrial Reserve Act of 1948
2	DODI 4215.1	H.R. 9286/P.L. 93-155	Items 5, 6, 10, 13, 14, 16, 23, 26, 27, 28
3	ASPR, Sec. XIII	H.R. 9286/P.L. 93-155	No references to reviewed directives
4	AR 700-90	DOD Directives & Instructions as listed in AR 700-90 Appendix A	Items 2, 3, 5, 6, 7, 8, 10, 12, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 37
5	AR 700-43	DODI 4215.18 (Item 13)	Items 2, 3, 8, 9, 14, 15, 26, 27, 28, 34
6	DODD 4005.1	H.R. 9286/P.L. 93-155	Items 3, 7, 10, 13, 23, 24
7	DODI 4005.3	H.R. 9286/P.L. 93-155	Items 6, 10, 24, 25
8	ASPR, Appendix B	H.R. 9286/P.L. 93-155	Item 5
9	ASPR, Supplement No. 3	DODD 5126.22 & Title 10, United States Code 2202	Item 8
10	DOD 4005.3-M (dtd 12/68)	DODI 4005.3 (Item 7)	Items 3, 6, 12, 13, 24

*Directives are identified by line item number in Table IX-1.

TABLE IX-3 (Cont)

ITEM	GOV'T DIRECTIVE	DIRECTION/AUTHORIZATION	REFERENCES*
11	DSAM 4005.1	DODI 4005.3 (Item 7)	Items 3, 10, 14, 16, 24, 25
12	DOD 4005.3-H	H.R. 9286/P.L. 93-155	Items 4, 10, 11
13	DODD 4275.5	H.R. 9286/P.L. 93-155	Items 3, 14
14	DODD 4215.18	H.R. 9286/P.L. 93-155	Items 2, 8, 17
15	MIL-STD-107E	H.R. 9286/P.L. 93-155	No references to reviewed directives
16	DODI 4215.14	H.R. 9286/P.L. 93-155	Items 2, 5, 23
17	DODI 4145.19	H.R. 9286/P.L. 93-155	This directive could not be obtained.
18	DODI 4155.4	H.R. 9286/P.L. 93-155	Items 2, 8
19	TM 38-260	H.R. 9286/P.L. 93-155	Items 5, 14, 15
20	AR 37-100-FY	H.R. 9286/P.L. 93-155	Item 4
21	AR 71-6	H.R. 9286/P.L. 93-155	No references to reviewed directives
22	DA PAM 700-23	DODI 4215.14 (Item 16)	Items 4, 5, 16

*Directives are identified by line item number in Table IX-1.

TABLE IX-3 (Cont)

ITEM	GOV'T DIRECTIVE	DIRECTION/AUTHORIZATION	REFERENCES*
23	DODI 7041.3	H.R. 9296/P.L. 93-155	This directive is not yet obtained.
24	DOD Form 1519	DOD 4005.3-M (Item 10)	Items 7, 10
25	RCS:DD-I&L (A) 1201	DODI 4005.3 (Item 7)	Item 4
26	Format A	DODI 4215.1 (Item 2)	Items 2, 4, 5
27	Format B	DODI 4215.1 (Item 2)	Items 2, 4, 5
28	Format C	DODI 4215.1 (Item 2)	Items 2, 4, 5
29	RCS: DD-I&L (SA) 784	AR 700-90 (Item 4)	Item 4
30	PEP Change Notice	AR 700-90 (Item 4)	Item 4
31	RCS: DD-I&L (A) 642	AR 700-90 (Item 4)	Item 4
32	RCS: CSCRD-166	AR 700-90 (Item 4)	Item 4
33	RCS: CSCRD-163	AR 700-90 (Item 4)	Item 4
34	DD Form 770	AR 700-43 (Item 5)	Item 5
35	RCS:DD-I&L (A) 1272	AR 700-90 (Item 4)	Item 4

*Directives are identified by line item number in Table IX-1.

TABLE IX-3 (Cont)

ITEM	GOV'T DIRECTIVE	DIRECTION/AUTHORIZATION	REFERENCES*
36	SP5, SP6	DIPEC Computer Listings	No references to reviewed directives
37	AR 37-40	AR 700-90 (Item 4)	Item 4

*Directives are identified by line item number in Table IX-1.

X. RESOURCE MANAGEMENT SYSTEM

A. GENERAL

In the preceding sections of this report, frequent reference has been made to the need for an integrated resource management system to serve the needs of those responsible for industrial preparedness planning. This section addresses that need. Subsection B summarizes the elements of the current problem, which indicate the need for a systematic approach to resource management. The functions that the resource management system should perform to ensure proper management of industrial preparedness planning are described in Subsection C, and Subsection D discusses possible alternatives that could be followed to develop the resource management system. Subsection E describes a recommended approach for developing a resource management system that will be responsive to the needs of industrial preparedness planning.

B. ELEMENTS OF THE PROBLEM

The elements of the problem can be described in terms of response problems, methods problems, and data problems.

1. Response Problems

ARRCOM is the single-service manager charged with the responsibility for industrial preparedness planning. In this role, ARRCOM compares the planned item requirements with the production capabilities of the PEP's, GOCO's, and GOGO's to develop short- and long-term production base plans, which in turn determine the requirements for modernization and expansion programs, layaway of facilities, and maintenance activities. ARRCOM also develops information used by SAMPAM (System for Automation of Materiel Plans for Army Materiel) and AMP (Army Materiel Plan) to create the authorized acquisition objective.

Industrial preparedness planning is a dynamic, constantly changing task. Newly planned items are being introduced, while others are being phased out. Quantities and time frames are changing. Technology, OSHA and EPA requirements, manufacturing processes, skill levels, and equipment condition and location are all changing in varying degrees. Even current and prospective producers change, as does the availability and

amount of funds with which to maintain, rehabilitate, and modernize production facilities.

A major problem for ARRCOM in managing industrial preparedness planning tasks is keeping the production base synchronized with the changing requirements. The selection and shifting of resources to react to changing scenarios or to meet an actual mobilization crisis are seriously handicapped by the delays inherent in current manual systems for evaluating alternatives and developing plans.

It has been suggested during this study that the "old guard" would probably know what to do in the event of mobilization, since they were there during previous mobilization periods. However, since the "old guard" is gradually retiring from active service and written procedures for implementing mobilization are often lacking or incomplete, the problem is becoming acute. Even if the "old guard" were being replaced with others of like expertise, it is doubtful whether they could be expected to achieve mobilization in the time frames that are now being considered. The former 12 to 24 months' time allowance for startup is quite different from the presently allotted 4 to 6 months. So the problem of response time, that problem of reacting effectively to the many changes occurring in the body of resources, is being aggravated by the current reliance on relatively slow manual planning and a dwindling pool of expertise.

2. Methods Problems

The current source for obtaining information relative to a producer's capabilities is the DD Form 1519. This form is discussed at length in Section V, and was judged to be inadequate as a method for obtaining reliable and complete information about producers' capabilities. Current PEP inventory methods are inadequate in the following respects.

a. Only industrial plant equipment are included in the inventory. Other equipment data necessary for analysis of production capability, such as non-PEP Government-owned equipment, producer-owned equipment, and equipment with a purchase value under $1000, are not provided.

b. Physical inventories, which include condition assessments, are not timely. Typically, the periodic 5- to 10-year

updates of the DIPEC files are not timely, thus cannot ensure effective IPP. It has been found that current inventory listings neither list the inventory accurately nor reflect the current condition of industrial plant equipment in 40% of the cases studied. Hence, DIPEC data are considered questionable from the standpoint of timely information.

c. Present inventory records do not associate equipment with the items the equipment can produce. There is currently no method for relating planned item requirements to equipment needs. This relationship must be identified and maintained in order to respond to changing requirements.

d. The element of control appears to be weak in the management cycle in some cases, possibly caused by the slowness of manual methods. Plans are made and passed on for execution, but it is dubious as to whether there is adequate feedback in order to monitor execution of the plans. If feedback is weak, it follows that needed variances to the plans are not detected and communicated to the planners in time for them to make decisions, which cannot then be executed in a timely manner.

3. Data Problems

Several problems related to data have been discussed in Subsection 2, above. It is not known whether certain data are not used because they are not available, or whether the data have never been requested. The important thing is that all the data needed to make accurate and timely preparedness plans are not available.

There are many sources for needed data. The DIPEC inventory listing is one source that is being expanded, in the form of the Plant Equipment Package Management Information System (PEPMIS). The expanded PEPMIS will include OPE, ST, STE, and all industrial plant equipment that are definitely needed. Still missing, however, are data concerning producer-owned equipment that are necessary to the productive capability of the producer. A major shortcoming of PEPMIS is that it is primarily an inventory file rather than a system to assist in managing plant equipment. No attempt is being made with PEPMIS, at this writing, to identify production voids, multiple-use equipment,

or, for example, equipment inadvertently planned for production in excess of its capacity.

Other sources of information for the data bank could include production base management, ARRCOM, JCAP, DCAS, KE/SAI, audits made by former CA/CD/CRIB teams, and the producers. The problem is one of control over the integrity of the data being supplied to the data bank. As no one agency can supply all the information necessary for industrial preparedness planning, the responsibility for accurate and timely data must lie with those who do the collecting and entry. Responsibility for the auditing and control of data integrity should lie either with the primary user of the data or with an agency responsible to the primary user, such as a data processing unit or auditing group. Computer assistance in this area can be valuable in the form of systems that prevent the entry of incorrect data, preferably at the time the entry takes place. Also, a well designed computer system can detect and alert the user to special problems such as missing data and the absence of scheduled updates. Currently, the Army has no system for industrial preparedness planning that addresses the collection of reliable data on a continuing basis.

C. REQUIRED SYSTEM FUNCTIONS

The system functions discussed here are those that have become evident through study of the munitions metal parts production base assigned to private industry. It is therefore assumed that additional requirements could be found in a broader study of the total functions and requirements of industrial preparedness planning.

The monitoring of producer capabilities is essential to proper resource management. All producer related information required for industrial preparedness planning must reside in the data bank used by the resource management system. This would include DD Form 1519 data or equivalent, technical data concerned with modernization activity and with mobilization, description of manufacture, technical data packages, and model line information. These data should be available for current producers as well as potential and planned mobilization producers.

The resource management system must also monitor the inventory of finished goods, skills, and equipment. Again, all data relevant to the readiness of the production base must be included in the data bank. A fresh approach must be taken in the area of equipment inventory. If the malfunction or absence of any item of equipment

could impact the capability to produce, information on that item of equipment should be included in the data bank. Ownership or original cost, for example, should not be criteria used for inclusion in the equipment inventory. The capability must exist to identify voids, multiple-use equipment, and equipment with undercapacities.

In the case of both the inventory and producer capability data, an initial data collection effort and an ongoing system for data maintenance must be provided. The scope of this activity is large, but it cannot be estimated until all data requirements are known. Meanwhile, a definite commitment should be made to establish and maintain accurate up-to-date resource data.

With all pertinent data available in the data bank, the functions required for the programs and subsystems that make up the resource management system are:

(1) The system must have the capability to analyze all factors that are important to producer capability in order to assist industrial preparedness planning management in the selection of producers both for current production and for mobilization production. Any analysis of producer capability must include subcontractor requirements relative to each producer. The ability to relate planned item requirements to producer capabilities is a key consideration in providing this function.

(2) The planning processes should be automated wherever practical to minimize reaction time and the use of clerical manpower. Manpower savings could take the form of headcount reduction or cost avoidance through reassignment of personnel to the data collection and maintenance effort. Meanwhile, substantial computer assistance must be provided to support the preparation of the production base plan (current), production base analysis (long term), and the many plans used for inventory management including layaway, maintenance, rehabilitation, and procurement. Computer support is essential to the development of timely and effective mobilization plans and to the monitoring of mobilization progress, so that readiness can be accurately measured and reported.

(3) An interface capability is needed between the data bank and the analytical tools being developed by JCAP and ARRCOM. These tools are models that depend upon accurate and timely input data from the data bank. KE/SAI studies indicate that all of these models lack sufficient, accurate, and/or verifiable input data.

(4) The resource management system must be able to respond to many changes as discussed above in Subsection B. Also, it must be able to respond quickly enough to make corrective decisions and allow those decisions to be implemented. Timeliness can mean different things to different users, with different meanings in a transition from peacetime conditions to mobilization; therefore, timeliness must be provided for in the resource management system.

(5) Another important function of the system is as a means for channeling readiness information through the chain of command to the policy levels. Compatibility should be maintained between the resource management system and other systems used by various commands, to report readiness status and other required information to the top policy making levels. For example, at a higher level it is necessary to provide information concerned with the balance between ammunition and the weapons systems that use the ammunition; therefore, some degree of coordination is necessary to ensure compatibility between the systems used by the contributing commands. This coordination should be incorporated in the preliminary design stage of the system if maximum success is to be achieved.

(6) The ability of the users of the system to analyze the impact of alternative decisions before they are implemented is necessary. For example, what would happen to the readiness posture if a piece of equipment were to be reassigned to a different PEP? What would be the most cost effective maintenance schedule? What if one producer is chosen as opposed to another? What effect will a change in given modernization priority have upon readiness? If the capability exists to test alternatives before action is taken, the value of the system will be greatly enhanced for decision-making purposes. The system must deal with potentially volatile situations; therefore, rapid and correct response must be provided to its users.

D. POSSIBLE COURSES OF ACTION

It has been concluded that increased computer assistance is needed for resource management in industrial preparedness planning. Therefore, the discussion of possible courses of action does not consider the choice of doing nothing; it deals, instead, with achieving the goal of a complete resource management system through various types of implementation activities.

1. One possible course of action is to design a single system for all levels of management and all commands involved with industrial preparedness planning and then implement the system, one command at a time. Although it may sound attractive to design and implement the entire system at once and at the same time achieve the highest degree of standardization and overall system compatibility, there are serious drawbacks to such an approach, one being the length of time required to achieve results. The information needs of all industrial preparedness planning management levels and commands would require an extended time for study and analysis. Compromises would have to be made between commands relative to standardizing computer equipment, data, and methods. Because the requirements for a given command tend to be largely unique, different subsystems for each command are indicated, linked in turn to a common reporting system for supplying readiness information to top policy levels. To implement such a system on such a large scale is not considered practical.

2. A second approach is to design a system for a single command, ARRCOM in this case, and implement it for PEP's, GOCO's and GOGO's, then for COCO's. Although this approach assumes a more reasonable scope of activity, it does not address all areas of industrial preparedness planning until total implementation is accomplished. Therefore, the vertical flow of information through all levels of industrial preparedness planning management would not be complete until the late phases of implementation.

3. A third course of action is to design a system for ARRCOM, as stated above, and implement it by planned items or logical groupings of items. A more practical scope of activity would be maintained, and at the same time all aspects of industrial preparedness planning, from the bottom to the top levels of management, would be served, beginning with the first implementation. As the data collection effort progressed, more planned items will be included until total implementation is achieved.

4. Another course of action is to design a system for managing PEP's and implement it by planned items or logical groupings of items. The scope of such a system would probably be too narrow to be beneficial to industrial preparedness planning, as PEP's are only one of several factors involved in industrial preparedness planning of the munitions production base. According to the JCAP Agreement, Part 4, Chapter 6, Section 1, dated November

1975, the purpose of PEPMIS is "for accounting and reporting of government-owned conventional ammunition plant equipment. The purpose of this MIS is to include plant equipment only for producers to whom a PEP has been assigned." This does not provide for a complete readiness analysis, because producer-owned equipment and its condition are excluded. Unassigned PEP's are also excluded, making the tasks of filling voids or assigning equipment to new producers more difficult. No meaningful statements of readiness can be made without considering the readiness of related resource areas such as facilities, producer-owned equipment, finished goods inventory, and skills. The resource management of PEP's, however, must be a part of the overall resource management system, along with pertinent information from modernization and expansion projects.

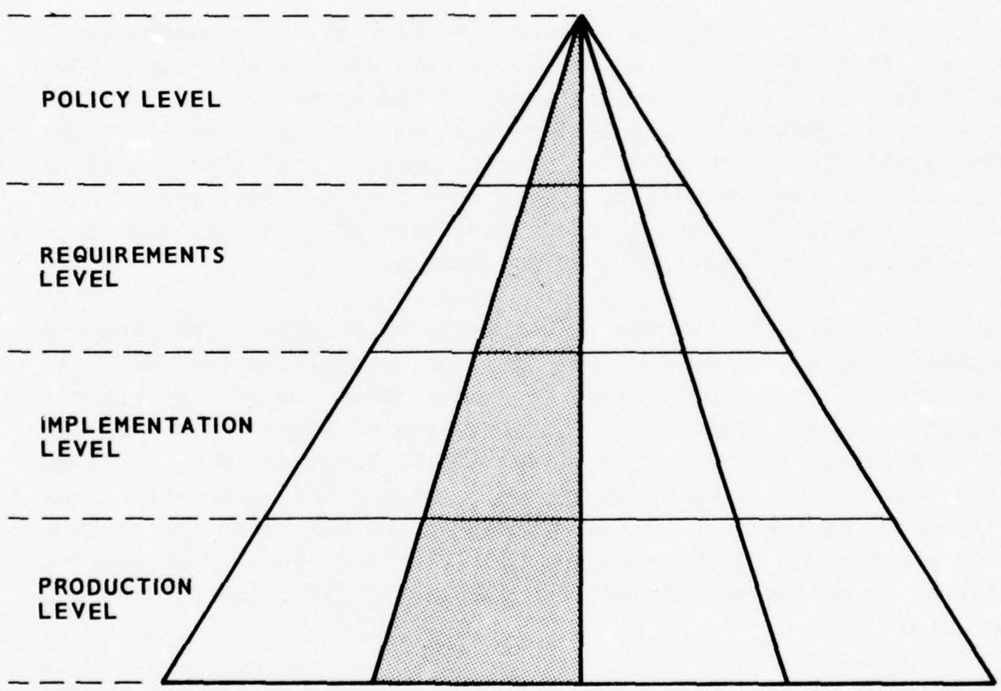
E. RECOMMENDED COURSE OF ACTION

For the resource management system to be effective, its scope must reach beyond that of PEP's for munitions metal parts production in the private sector. A resource management system that addresses only metal parts production in the private sector is almost meaningless for industrial preparedness planning, unless propellants and explosives, fuzes, load, assemble, and pack operations, and the warehousing and shipping of finished products are considered. Such a system would be of dubious value if the basic management functions of planning, execution, and control through all levels of industrial preparedness planning management were not integrated. Government-owned plants, the ARRCOM/producer interface, Navy and Air Force requirements, formulation of requirements by ARRCOM, the flow of information from the National Security Council (NSC) and Joint Chiefs of Staff (JCS) down through DOD, DA, DARCOM, and ARRCOM to the production levels, and vice versa, must all be analyzed and provided for if the resource management system is to be an effective tool for managing industrial preparedness planning. These areas contribute to preparedness, although they have been outside the scope of current KE/SAI study activity. If these areas have been considered in other studies, the information should be integrated into the design of the system. If they have not been studied, they should be examined to provide for ARRCOM's industrial preparedness planning function.

Figure X-1 represents the scope of the recommended design activity. This is a functional approach that is vertically oriented. The shaded area represents the function of managing the industrial preparedness of the munitions base, the area the resource

FIGURE X - 1

SYSTEM DESIGN SCOPE



management system should be designed to serve. It is vertically oriented in that it provides for the flow of information through all levels of management concerned with the function. The policy level includes JCS, NSC, DOD, and DA. The requirements level includes DARCOM and ARRCOM. The implementation level consists of ARRCOM and associated defense agencies such as DCAS, DSA, and DIPEC. The production level includes producers and subcontractors.

This design approach has the advantage of considering all pertinent aspects of the function before implementation begins. This tends to minimize the need for later modifications, which could delay useful application of the system and add to the cost of implementation.

The implementation of the system can occur piece-by-piece, based upon a prioritized plan of action to be developed in the early design stage. In this manner, the value of the system can be realized as the implementation progresses, rather than having to wait for the whole system to be completed. In fact, some of the pieces, such as PEPMIS and the various models, are already being developed. Care must be exercised, however, to ensure that these subsystems serve their intended purpose in the overall system.

Figure X-2 illustrates the relationship of PEPMIS to the resource management system in terms of the scope of information involved. As in Figure X-1, the shaded area represents the scope of the resource management system. The scope of information of PEPMIS, as it has been described in the JCAP Agreement of November 1975, is shown within that of the resource management system. The remaining area encompassed by the resource management system comprises the various models and systems being developed by JCAP and future subsystems that will be needed to complete a total vertically oriented information flow.

An overview of the resource management system is illustrated in Figure X-3, showing the relationship of the various agencies to the data bank and to the information flow of the system.

At the center of the system is the data bank that contains the numerous bodies of information necessary for industrial preparedness planning management. The illustration tends to show these bodies as separate files; however, this is for illustrative purposes only, to highlight the types of information needed. In the actual system, this information will be linked together logically, depending upon the detailed design requirements of the data bank. Eventually, the data bank should appear to the users of the system as a single,

FIGURE X - 2

PEPMIS INFORMATION SCOPE

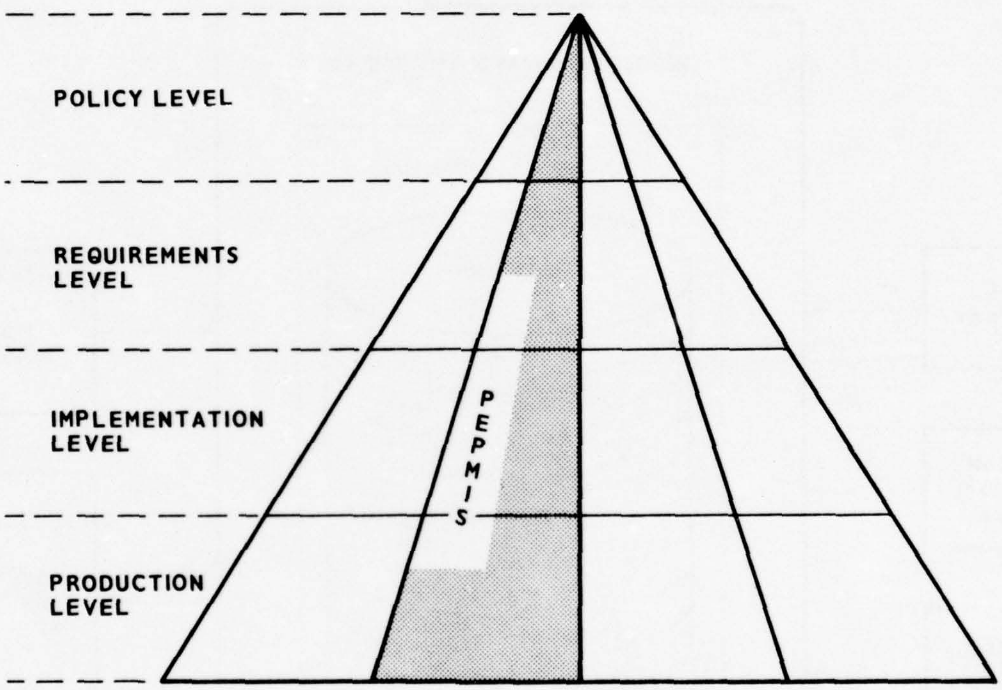
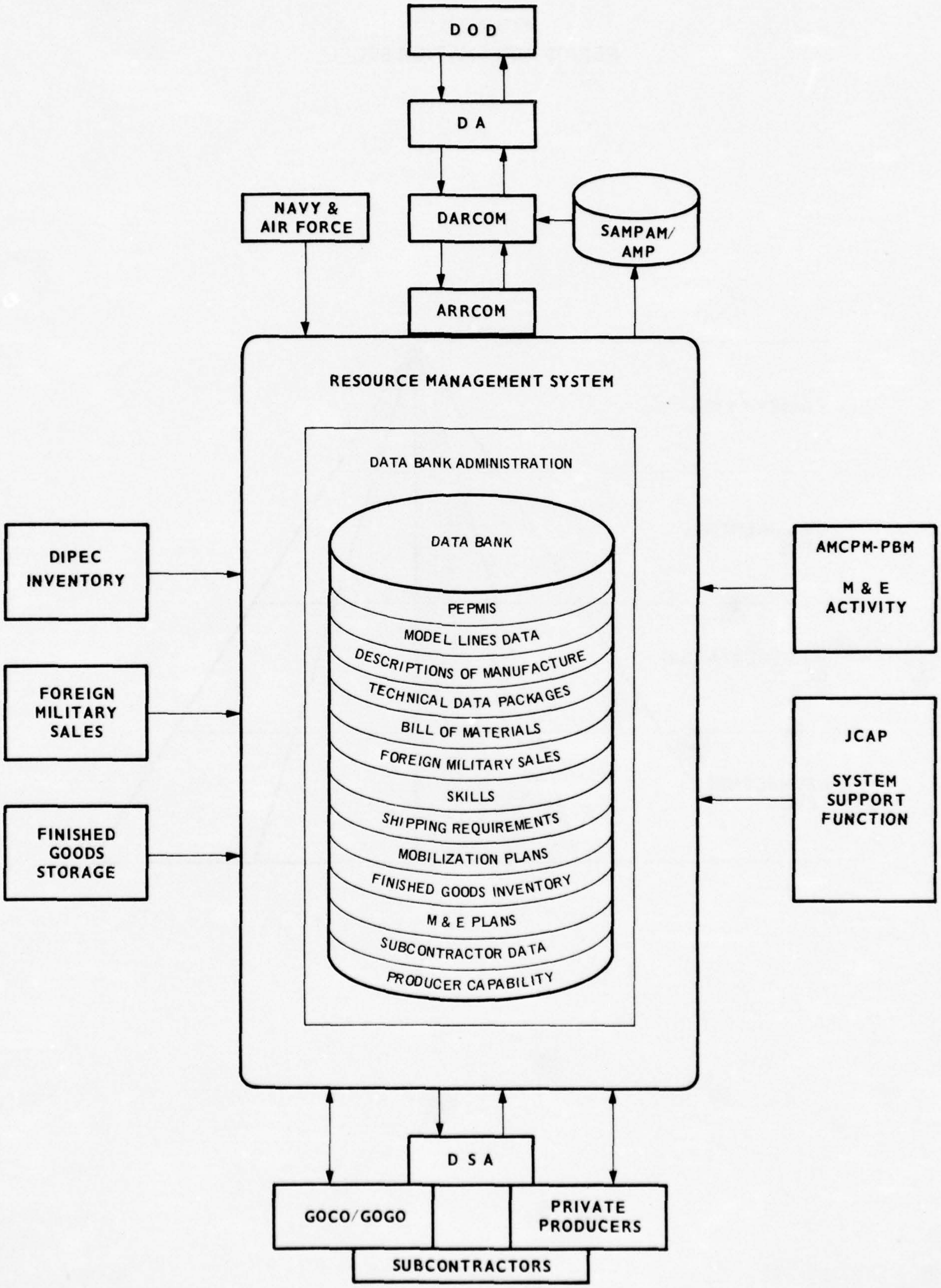


FIGURE X - 3

DATA BANK CONCEPT



integrated collection of existing and planned data, regardless of its actual physical description.

It should be emphasized that a great deal more information will be required than currently is envisioned for PEPMIS. The recent effort to expand the capabilities of PEPMIS is a step in the right direction since it involves a change from sequentially oriented magnetic tape files to the more up to-date "data base" technology. This change is considered essential to the resource management system.

Referring to Figure X-3, the important function of data bank administration surrounds the data bank. This function should be responsible to, if not under the direct control of, the primary system user, ARRCOM. It involves responsibility for the following functions:

- o Data organization and storage requirements
- o Access standards and application programming guidance
- o Data security
- o Control documentation
- o Audit trails
- o Performance evaluation and statistics

The area surrounding the data bank administration function represents ARRCOM's function of industrial preparedness planning and execution and the relationship of that function to various supporting and using functions. It shows requirements information coming into the system from DARCOM and readiness reporting flowing back up to the top policy levels of the Army, along with input for SAMPAM and AMP returning to DARCOM. At the bottom of Figure X-3 is the production level characterized by private sector producers, the GOCO's/GOGO's and the subcontractors. Each of these areas is required to supply information to the system relative to production capabilities and capacities, mobilization activity, equipment maintenance, etc. In turn, they receive information, such as production schedules, from ARRCOM. An interface will also be required to supply finished-goods inventory data to the system. The DIPEC equipment inventory is a source for the PEPMIS portion of the data bank. JCAP is visualized in the role of providing system analysis and programming support for the resource management system. The Project Manager for Munitions Production Base Modernization and Expansion (AMCPM-PBM) provides information concerning production base modernization and expansion activities.

Foreign military sales is another area of activity that needs to be linked informationally with the data bank through ARRCOM.

The various information links to the data bank can occur in several ways. One method can be through direct data communications, and another might be indirect: the result of providing input to, or receiving output from, one of the subsystems or models in the system. In any event, the system and the data bank are under the control of ARRCOM, the primary user. Although the specific details of each information link in the system would be defined in the detailed design phase of system development, it is possible to illustrate conceptually how one part of the system might be used to help an industrial preparedness planning problem. Figure X-4 shows how the resource management system might assist ARRCOM industrial preparedness planning management in solving the problems associated with the requirement for a new planned item.

Similarly, the resource management system would provide the following industrial preparedness planning management assistance:

(1) Select planned producers.
(2) Detect mobilization bottlenecks.
(3) Generate cash flow and budget analysis.
(4) Produce detailed startup critical path methods.
(5) Control finished goods inventory.
(6) Evaluate the impact of alternative priority selections.
(7) Produce shipping schedules for end items.
(8) Analyze facilities.
(9) Establish rehabilitation/modernization priorities.
(10) Determine maintenance priorities and schedules.
(11) Maintain skills inventory.

It is suggested that a team be established to determine all information requirements. The same team would then continue as the nucleus of the subsequent detailed design and implementation activities. Initially, this team should consist of one member from the staff of the primary system user (ARRCOM's Industrial Management Directorate), who is well versed in the information needs of the directorate, and one senior systems analyst with a broad base of experience in manufacturing applications, data base technology, and distributed processing. The following schedule outlines the tasks that need to be completed, with Steps 1, 2, and 3 being performed by the initial two-man team; this schedule is also addressed, in a different format, in Subsection III.G.6:

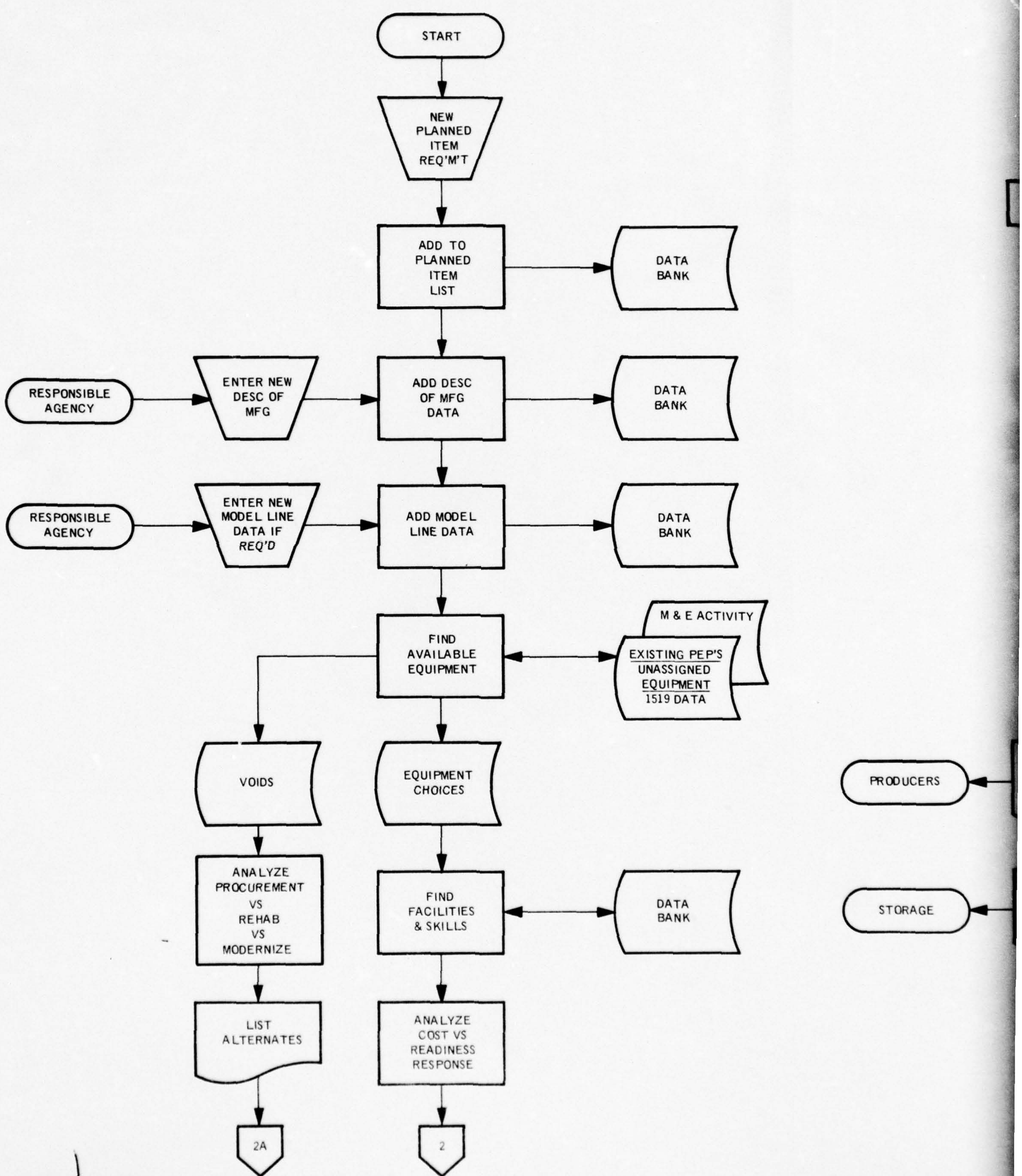
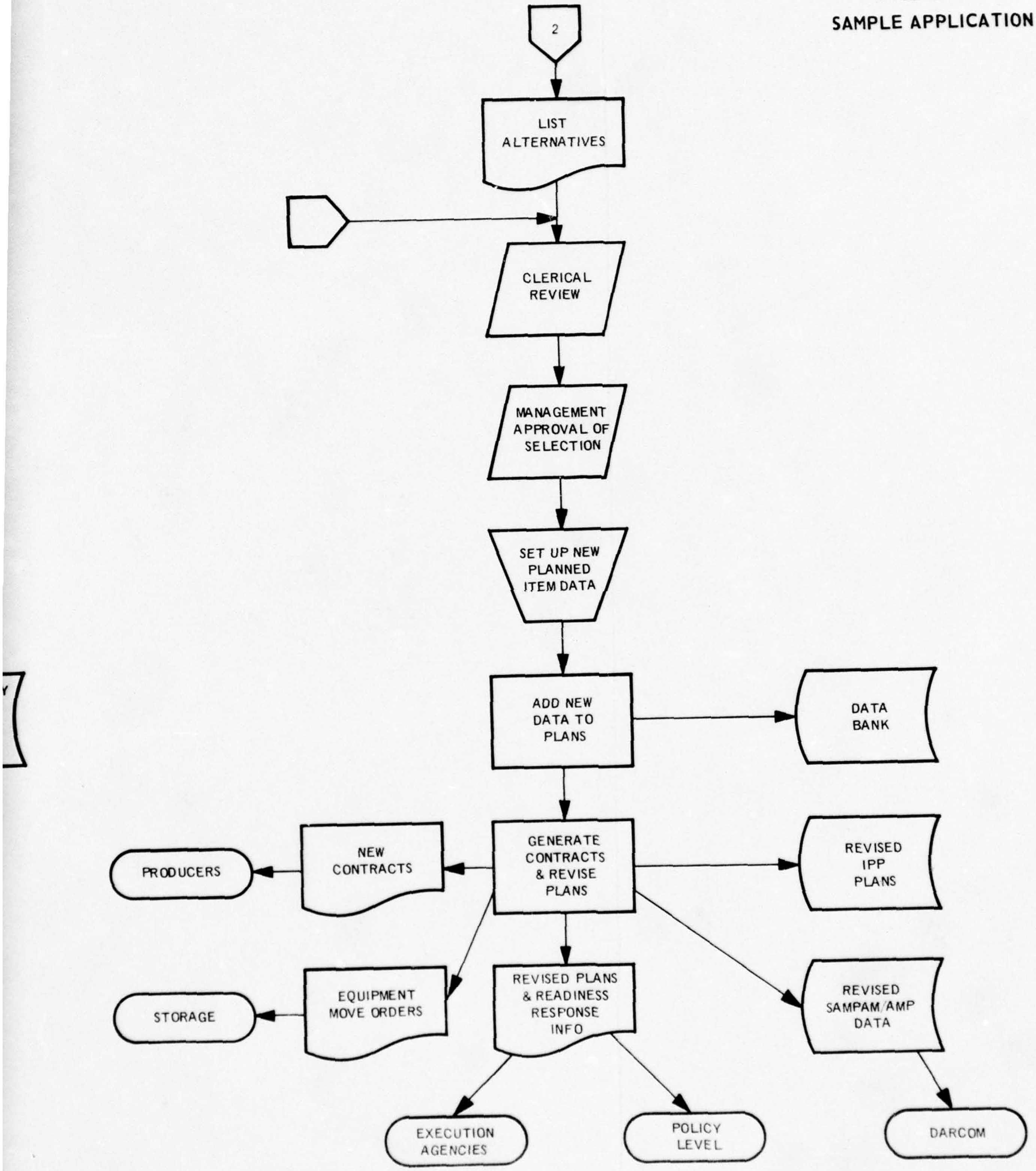

START
NEW PLANNED ITEM REQ'M'T
ADD TO PLANNED ITEM LIST
DATA BANK
RESPONSIBLE AGENCY
ENTER NEW DESC OF MFG
ADD DESC OF MFG DATA
DATA BANK
RESPONSIBLE AGENCY
ENTER NEW MODEL LINE DATA IF REQ'D
ADD MODEL LINE DATA
DATA BANK
FIND AVAILABLE EQUIPMENT
M & E ACTIVITY
EXISTING PEP'S
UNASSIGNED EQUIPMENT
1519 DATA
VOIDS
EQUIPMENT CHOICES
PRODUCERS
ANALYZE PROCUREMENT VS REHAB VS MODERNIZE
FIND FACILITIES & SKILLS
DATA BANK
STORAGE
LIST ALTERNATES
ANALYZE COST VS READINESS RESPONSE
2A
2

FIGURE X - 4

SAMPLE APPLICATION



1. Complete the determination of information requirements:

    a. Identify all users and their specific data needs.

    b. Identify current systems, methods, and costs.

    c. Survey management and analyze the results. Develop a clear understanding of system objectives.

    d. Identify the information flow necessary to meet user needs.

    e. Determine system performance requirements:

        (1) Report volumes and frequencies
        (2) File maintenance volumes and frequencies
        (3) Inquiry response requirements.

    f. Define data requirements.

    g. Define data relationships in the data bank.

    h. Identify data sources.

    i. Define data acquisition and maintenance methods.

    j. Determine system security and backup requirements.

    k. Determine computer equipment requirements.

    l. Determine software requirements.

    At this point, reasonably accurate estimates can be made relative to the labor and equipment costs necessary to implement the resource management system. The proposed system can also be described in detail: how it will operate and what information will be available from it.

2. Prepare a feasibility report to include:

    a. Current methods
    b. Proposed system
    c. Cost/value analysis
    d. Implementation schedule
    e. Cash flow analysis

3. Obtain approval to proceed with detailed design and implementation.

4. Enlarge the design team:

   a. Add data bank administrator
   b. Add application and systems programmers, as required

5. Perform detailed design:

   a. Data collection methods
   b. Data bank design:

      (1) Determine logical data relationships.
      (2) Describe inquiries and responses.
      (3) Design file maintenance specifications.
      (4) Design communications and terminal network.
      (5) Describe data bank security specifications.

   c. Write program specifications.

6. Begin data collection.
7. Provide for equipment modifications.
8. Write programs.
9. Test programs.
10. Build the data bank.
11. Prepare operation manuals.
12. Test total system.
13. Train personnel.
14. Conduct system fine tuning.
15. Verify user acceptance.

XI. APPENDIX

A. GLOSSARY

TERM	DEFINITION
Armed Services Production Planning Officer (ASPPO)	The DOD designee responsible for performing IPP in plants under his jurisdiction.
Army Industrial Preparedness Program (AIPP)	Involves the development and maintenance of an industrial base capable of supporting approved forces in current and future military operations. AIPP consists of IPP, PBSP, and IPO (Ref. Chapter 1, AR 700-90).
Army Materiel Plan (AMP)	A planning document which provides mobilization consumption requirements for the AIPP. These requirements are the basis for planning with industry and the Government-owned industrial production base, including Production Base Support.
Assigned PEP	A PEP that is currently assigned to a planned producer.
Authorized Acquisition Objective (AAO)	The quantity of an item authorized for peacetime acquisition to equip the U.S. Army approved force and specified allies in peacetime and sustain these forces in wartime from D-Day through the period and at the level of support prescribed by the latest OSD Materiel Support Planning Guidance. The authorized acquisition objective is the gross requirement minus the production offset.

TERM	DEFINITION
Cold Base	A readiness condition which denotes that production equipment is laid away at a site other than the planned production facility..
Condition Assessment (CA)	A qualitative and quantitative procedure that combines current experience and professional judgment with information obtained from the review of performance and maintenance records to evaluate the specifications and condition of equipment.
Condition Code	An alpha-numeric code signifying condition of IPE. See Appendix 1C, AR 700-43.
Condition Determination	Analysis by examination and testing to determine the operational and tolerance characteristics of machinery and equipment as measured or compared to a specific level of performance.
Defense Industrial Plant Equipment Center (DIPEC)	A major field activity of the Defense Supply Agency (DSA) responsible for providing services to the military departments in performance of the functions set forth in AR 700-90 and in DSA Manual 4215.1 (DIPEC Operations).
DOD Component	A Military Department of Defense Agency and its subordinate activities.
Hot Base	A readiness condition which denotes that production equipment is in current production or will be producing on M-day.

TERM	DEFINITION
Industrial Base	That part of the total privately-owned and Government-owned industrial production and maintenance capacity of the United States, its territories and possessions, as well as capacity located in Canada, expected to be available during emergencies to manufacture and repair items required by military services. The Army industrial base consists of: a. Contractor-owned and contractor-operated (COCO) facilities. b. Government-owned and Government-operated (GOGO) plants, arsenals, production test facilities, and depot level maintenance facilities. c. Government-owned and contractor-operated (GOCO) plants. d. Plant equipment packages capable of augmenting the above capabilities.
U.S. Army Industrial Base Engineering Activity (IBEA)	IBEA provides technical coordination and assistance to HQ ARRCOM and DARCOM commodity commands in the implementation of IPP, (was PEQUA).
Industrial Plant Equipment (IPE)	Plant equipment with an acquisition cost of $1,000 or more used for the purpose of cutting, abrading, grinding, shaping, forming, joining, testing, measuring, heating, treating, or otherwise altering the physical, electrical or chemical properties of materials, components or end items, entailed in manufacturing, maintenance, supply processing, assembly, or research and development operations.

TERM	DEFINITION
IPE, Idle	Government-owned IPE in contractor or military facilities which is no longer required and/or not being used for the purpose for which it was provided or authorized.
Industrial Preparedness Measures (IPM)	Measures or actions designed to shorten post M-day leadtime or to increase production/repair capacity for planned items.
Industrial Preparedness Operations (IPO)	Those operations conducted to sustain the industrial base.
Industrial Preparedness Planning (IPP)	Those actions and associated resources required for all plans or measures necessary to establish and maintain an industrial base, both Government-owned and privately owned, that is required to support current, wartime, or other contingency military requirements with military items. It includes Industrial Preparedness Measures, such as modernization and preservation of the production facilities and contributory activities and services for planning with industry which are essential to the accomplishment of the complete Industrial Preparedness Program.
Industrial Preparedness Planning List (IPPL)	Items which have been selected for Industrial Preparedness Planning by each DOD component. Items should be limited to approximately 2000 items including major weapon systems and major weapon systems should be limited to 35 per military department.

TERM	DEFINITION
Layaway	Process of retaining and storing industrial facilities that are no longer required to support current production, but are required to support approved forces in an emergency.
Maintenance Base	The total privately owned and Government-owned industrial maintenance capacity of the United States, its territories and possessions which is or may be made available to the Army for depot maintenance of items required by the US Armed Forces. The maintenance base and the production base jointly comprise the industrial base.
Minimum Sustaining Rate (MSR)	The lowest monthly rate at which the planned item can be produced without increasing the unit cost above that cost of the item which would apply in a maximum single shift operation.
Mobilization Base	The total production base and whatever additional industrial production capacity will be available as a result of mobilization.
Other Plant Equipment (OPE)	Other plant equipment (OPE) is defined as that part of plant equipment (PE) excluding IPE and is categorized below: o Minor plant equipment means an item of plant equipment having an acquisition cost of less than $1000 and other plant equipment when so designated. o Any plant equipment with an acquisition cost of $1000 or more that is used to operate and maintain a facility, e.g., office, cafeteria, and medical equipment.

TERM	DEFINITION
1-8-5 Basis	One shift, eight hours, five days/week.
Pilot Lot	A minimum quantity of planned items identified with a specific line of production equipment and processes and required for the purpose of proofing that production equipment and testing those manufacturing processes.
Planned Item	The term "planned item" is used in this report to designate a product of the PEP producer. This could be a cartridge case, projectile, unloaded fuse, or other similar component of a complete end item that is loaded, assembled and packed (LAP).
Planned Item Production System	A concept postulated by this study to comprise all the elements required by mobilization planning. It is, therefore, a system of resources definition for planning and controlling ammunition production applicable to both mobilization as well as ongoing peacetime requirements. See Figure IV-1.
Plant Equipment (PE)	Personal property of a capital nature (consisting of equipment, machine tools, test equipment, furniture, vehicles, and accessory and auxiliary items, but excluding special tooling and special test equipment) used or capable of use in the manufacture of supplies or in the performance of services or for any administrative or general plant purpose.

TERM	DEFINITION
Plant Equipment Code (PEC)	A 12-digit subclassification system within the framework of the Federal Supply Classification (FSC) to encode the primary characteristics of items of IPE.
Plant Equipment Package (PEP)	A Government-owned complement of active and/or inactive plant equipment that has been formally approved for retention as part of the munitions production base by the Assistant Secretary of Defense (Installation and Logistics) [ASD (I&L)] and which has been assigned an ASOD number by the ASD (I&L) as defined in AR 700-43.
Production Base	The total privately owned and Government-owned industrial production capacity of the United States, its territories and possessions which is or may be made available to the Army for manufacture of items required by the United States Armed Forces.
Production Base Plan	Document which depicts the status of the industrial base that is available and is required for production or depot maintenance in the event of an emergency.
Production Base Support	Those measures taken to provide for establishment, augmentation, and improvement of production and testing capability; layaway of industrial plants and equipment; and production engineering in advance of quantity production. Includes contractual services of the Corps of Engineers required in connection with the preparation of cost estimates for facilities projects. (See AR 37-100-FY.)

TERM	DEFINITION
Rehabilitation	The restoration of a facility or equipment to a standard as near as possible to original or new condition in appearance, performance, and life expectancy. Rehabilitation of equipment involves removal from the production line, disassembly, inspection of all parts and components repair or replacement of defective elements using original manufacturer's tolerance or specifications, and subsequent reassembly and return to the production line. Maintenance of large installed presses, furnaces, and other equipment of similar nature which are not normally removed for rehabilitation will be considered repair for this purpose.
Severable Equipment	An item capable of being removed from one location and utilized at another without substantial loss of value thereto, or to the premises from which it is taken.
Small Business Set-Aside	Government contract reserved for bids of "responsible small businesses"; i.e., a contract excluding bids from all businesses not classified as small businesses.
Special Test Equipment (STE)	Electrical, electronic, hydraulic, pneumatic, mechanical or other items or assemblies of equipment, which are of such a specialized nature that, without modification or alteration, the use of such items (if they are to be used separately) or assemblies is limited to testing in the development or

TERM	DEFINITION
	production of particular planned items. The term "special test equipment" includes all components or any assemblies of such equipment but does not include consumable property, special tooling, or buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special test equipment), general or special machine tools, or similar capital items.
Special Tooling (ST)	All jigs, dies, fixtures, molds, patterns, taps, gages, other equipment and manufacturing aids, and replacements thereof, which are of such a specialized nature that, without substantial modification or alteration, their use is limited to the development or production or particular supplies or parts thereof, or the performance of particular services. The term includes all components of such items, but does not include consumable property, special test equipment, or buildings, nonseverable structures (except foundations and similar improvements necessary for the installation of special tooling) general or special machine tools, or similar capital items.
Technical Data Package (TDP)	A technical description of a planned item adequate for use in procurement of that item.
Technical Data Package List (TDPL)	The TDPL lists every drawing and every other document in the complete TDP. It is identified on the MIL-SPEC under the heading of "DRAWINGS."

TERM	DEFINITION
Unassigned PEP	A PEP that is not currently assigned to a planned producer.
Void	Missing equipment in planned production lines or PEP's; i.e., the equipment needed to build up the production at the rate required to optimize the economic balance between planned item stockage and layaway of equipment or to sustain the production level-off rate stipulated by the AMP.
Warm Base	A readiness condition which denotes that the facility is producing on M-day at the MSR.
X-Facility	Title used to indicate a facility or PEP which is not identified with a specific planned producer.

B. ABBREVIATIONS AND ACRONYMS

ABBREVIATION/ACRONYMS	DEFINITION
AAP	Army Ammunition Plant
ADPA	American Defense Preparedness Association
AIPP	Army Industrial Preparedness Program
AMCPM-PBM	Office of the Project Manager for Munitions Production Base Modernization and Expansion
AMP	Army Materiel Plan
APSA	Ammunition Procurement and Supply Agency
AR	Army Regulation
ARADCOM	Army Research and Development Command
ARMCOM	Armament Command
ARRCOM	Armament Materiel Readiness Command (Was ARMCOM)
ASA (I&L)	Assistant Secretary of the Army (Installation and Logistics)
ASD (I&L)	Assistant Secretary of Defense (Installation and Logistics)
ASOD	Original Designation of a PEP; i.e., an ASOD number
ASPPO	Armed Services Production Planning Officer

ABBREVIATION/ACRONYM	DEFINITION
ASPR	Armed Services Procurement Regulation
AVSCOM	Aviation System Command
BLS	Bureau of Labor Statistics
CA	Condition Assessment
CAD	Computer-Aided Design
CAM	Computer-Aided Manufacture
CD	Condition Determination
COCO	Contractor-owned, Contractor-operated
CRIB	Command Review of Industrial Base
DA	Department of the Army
DA PAM	DA Pamphlet
DAPPG	DA Planning and Policy Guidance
DARCOM	Development and Readiness Command
DCAS	Defense Contract Administration Services
DIPEC	Defense Industrial Plant Equipment Center
DOD	Department of Defense
DODD	DOD Directive
DODI	DOD Instruction
DODIER	DOD Industrial Equipment Reserve

ABBREVIATION/ACRONYM	DEFINITION
DofM	Description of Manufacture
DSA	Defense Supply Agency
DSAM	Defense Supply Agency Manual
ECOM	Electronics Command
EDP	Electronic Data Processing
EPA	Environmental Protection Agency
GFE	Government-Furnished Equipment
GOCO	Government-owned, Contractor-Operated
GOGO	Government-Owned, Government-Operated
HEW	Health, Education & Welfare Department
HQAMC	Headquarters, Army Materiel Command
HQDA	Headquarters, Department of the Army
H.R.	House Resolution
IBEA	Industrial Base Engineering Activity (was PEQUA)
IPE	Industrial Plant Equipment
IPM	Industrial Preparedness Measure
IPO	Industrial Preparedness Operations
IPP	Industrial Preparedness Planning

ABBREVIATION/ACRONYM	DEFINITION
IPPL	Industrial Preparedness Planning List
JCAP	Joint Committee on Ammunition Production
JCS	Joint Chiefs of Staff
KE/SAI	Kaiser Engineers/Stetter Associates, Inc.
MICOM	Missile Command
MIL-SPEC	Military Specification
MIS	Management Information System
MOB	Materiel (Planning)
MSC	Major Subordinate Command
MSR	Minimum Sustaining Rate
MUCOM	Munitions Command
NC	Numerical Control
NMM	National Manpower Matrix
NSC	National Security Council
O&M	Operations and Maintenance
OJT	On-the-Job Training
OPE	Other Plant Equipment
OSD	Office of Secretary of Defense (III.G only: Operational Sequence Diagram)

ABBREVIATION/ACRONYM	DEFINITION
OSHA	Occupational Safety and Health Administration
OSM	Operating System Manual
PBA	Production Base Analysis
PBM	Project Manager for Munitions Production Base Modernization Project Office (Informally: Production Base Modernization)
PBP	Production Base Plan
PE	Plant Equipment
PEC	Plant Equipment Code
PEP	Plant Equipment Package
PEPMIS	PEP Management Information System
PEQUA	U.S. Army Production Equipment Agency
PPPG	Procurement Planning and Policy Guidance
P.L.	Public Law
QA	Quality Assurance
RAMP	Review of Army Mobilization Planning
RCS	Reports Control Symbol
SAMPAM	System for Automation of Materiel Plans for Army Materiel
SCRAM	Standing Committee for Readiness of Army Materiel

ABBREVIATION/ACRONYM	DEFINITION
SECDEF	Secretary of Defense
SOP	Standard Operating Procedure
ST	Special Tooling
STE	Special Test Equipment
TARCOM	Tank/Automotive Readiness Readiness Command
TDP	Technical Data Package
TDPL	Technical Data Package List
TECOM	Test and Evaluation Command
TM	Technical Manual
TROSCOM	Troop Support Command
UAW	United Automobile Workers
US	United States

C. BIBLIOGRAPHY

References Cited

ADPA Seminar	American Defense Preparedness Association, Davenport Iowa, 3 February 1976
AR 37-40	Army Regulation Army Production Base Support Program Report RCS CSGLD-1123 (R1), 15 December 1971
AR 37-100-FY	Army Regulation The Army Accounting Classification Structure (Fiscal Code), 30 August 1974
AR 71-6	Army Regulation Type Classification/Reclassification of Army Materiel, 13 July 1973
AR 700-43	Army Regulation Defense Industrial Plant Equipment Center Operations, November 1973 (Also DSAM 4215.1)
AR 700-90	Army Regulation Logistics, Army Industrial Preparedness Program, 15 September 1975
APSA Reg. 715-3	Ammunition Procurement and Supply Agency Regulation. Description of Manufacture, 18 August 1967
ARMCOM	ARMCOM Briefing; ADM Reich, Deputy Assistant Secretary of Defense (Installation and Logistics), April 1971.
ARMCOM	ARMCOM Briefing; Oral to KE/SAI, February 1975
ARMCOM	ARMCOM Briefing; "Integrated Production Planning," October 1975

ARMCOM	ARMCOM Layaway Listing
Arthur D. Little, Inc.	"Industrial Preparedness in an Arms Control Environment: A Study of the Potential Impact of Sharp Increases in Military Procurement," Report prepared for Arms Control and Disarmament Agency, December 1974
ASPR	Armed Services Procurement Regulation Sect. XIII, Government Property, 20 August 1975
ASPR	Armed Services Procurement Regulation Appendix B, Government Property in Possession of Contractors, 1 July 1974
ASPR	Armed Services Procurement Regulation Supplement No. 3, Property Administration, 17 December 1975
ASPR 3-216	Armed Services Procurement Regulation Purchases in the Interest of National Defense or Industrial Mobilization, 9 July 1976
ASPR 14-101.4	Armed Services Procurement Regulation Quality Program Requirement, 28 July 1976
BLS Bull. 1824	Bureau of Labor Statistics Bulletin Occupation Manpower and Training Needs, Revised 1974
Contract DAAA21-75-C-0303	Department of the Army, Picatinny Arsenal, "PEP Modernization Program," to Kaiser Engineers/Stetter Associates Inc., July 1975
DA PAM 700-23	Department of the Army Pamphlet Replacement of Industrial Plant Equipment in Production Base Support Program, 20 June 1975
DARCOM	Letter DRCRP-IF to J.S. Ritchie (KE), 12 March 1976

DD Form 346	Department of Defense Form Bill of Materials for Raw and Semi-Fabricated Stock
DD Form 347	Department of Defense Form Bill of Material for Purchased Parts
DD Form 770	Department of Defense Form Inter-Departmental Request for Release of Equipment, 1 April 1954
DD Form 1342	Department of Defense Form Property Record, 1 February 1968
DD Form 1519	Department of Defense Form Industrial Preparedness Program Production Planning Schedule, 1 July 1972
DOD	Department of Defense Index of Specifications and Standards 1 July 1976, with bimonthly Supplements to 1 November 1976
DOD 4005.3-H	Department of Defense Handbook Register of Planned Emergency Producers (3 Vols), April 1975
DOD 4005.3-M	Department of Defense Manual Industrial Mobilization Production Planning, December 1968
DODD 4005.1	Department of Defense Directive Industrial Preparedness Production Planning, 18 July 1972
DODD 4215.18	Department of Defense Directive Management of Defense-Owned Industrial Plant Equipment (IPE), 7 March 1974
DODD 4275.5	Department of Defense Directive Industrial Facility Expansion and Replacement, 3 December 1971

DODD 5010.19	Department of Defense Directive Configuration Management, 17 July 1968
DODI 4005.3	Department of Defense Instruction Industrial Preparedness Production Planning Procedures, 28 July 1972
DODI 4155.4	Department of Defense Instruction Inspection and Reporting of Departmental Industrial and National Industrial Plant Reserve, 29 May 1973
DODI 4215.1	Department of Defense Instruction Plant Equipment Retention and Maintenance, 22 September 1972
DODI 4215.14	Department of Defense Instruction Replacement of Industrial Plant Equipment, 26 October 1972
DODI 7041.3	Department of Defense Instruction Economic Analysis of Proposed DOD Investments, 8 October 1972
DODI 7045.7	Department of Defense Instruction Planning, Programming, and Budgeting System, 29 October 1969.
DSA Form 103	Defense Supply Agency Form Inventory, PEP
DSAM 4005.1	Defense Supply Agency Manual Industrial Preparedness Planning, May 1975
DSAM 5215.1	Defense Supply Agency Manual Defense Industrial Plant Equipment Center Operations, 19 November 1973
FORMAT A	Plant Equipment Package Fact Sheet (AR 700-90)
FORMAT B	UNTITLED (Certification of PEP's; Compliance with Criteria for Retention) (AR 700-90)

FORMAT C	Report of Discontinuance of Plant Equipment Package (AR 700-90)
H.R. 9286/P.L. 93-155	House Resolution/Public Law Defense Industrial Reserve Act, 16 November 1973
	Industry/Department of Labor/MUCOM Briefing on Skills, November 1972
Iron Age (Periodical)	Article on Skills Availability, 16 June 1975
JCAP	Joint Committee on Ammunition Production Lead Time Study, 23 March 1975
	Joint Logistics Review Board Study
KE/SAI	Kaiser Engineers/Stetter Associates Inc. Contract DAAA21-75-C-0303 Task Reports:

Task	Report	Title	Date
A	75-86-R-1	Condition Assessment Plant Evaluation	November 1975
B-3	75-86-R-2	Equipment Rehabilitation Plan	March 1976
B-4	75-86-R-3	Equipment Layaway Plan	March 1976
F	75-86-R-11	Impact of Automation/ Mechanization on Startup Time	March 1977
B-5	75-86-R-5	Detailed Modernization Analysis	

	PEP	Firm/State	As Scheduled
Final:	065	Jackes-Evans/MO	31 January
	069	Olin/IL	31 January
	072	Borg Warner/IL	31 January
	208	Lear Siegler/CA	2 February
	422	Chamberlain/MA	21 February
	457	Silent Ind./CA	31 January
	465	Wells Marine/CA	31 January

656	Geo. K. Garrett/Pa	31 January
721	Barry L. Miller/CA	31 January
740	Northrop/CA	11 March
748	Amron/WI	1 March
757	General Time/AL	28 March
762	Galion Amco/OH	31 January
766	Medico/PA	18 March
768	Kisco/MO	14 March
773	Etowah Mfg./AL	18 April
842	Martin Marietta/CA	31 January
866	Heckethorn/TN	31 January
Prelim: 085	Clark Grave Vault/OH	11 February
098	Norris/CA	17 January
167	Rheem Mfg./LA	25 February
227	Temco/TN	15 March
399	Hamilton Technology/PA	1 February
436	General Time/IL	10 March
455	Chamberlain/IA	21 February
489	Action Mfg./PA	16 February
571	Stewart-Warner/IN	31 March
589	Weatherhead/OH	25 March
600	Honeywell/MN	18 January
602	Flinchbaugh/PA	1 March
780	REDM/NJ	14 March
786	Wilkinson/NB	4 February
794	Amer. Gear & Pinion/SC	4 March
818	Texas Inst./MA	15 February
843	KDI Precision Prod/OH	9 February
Letter: 196	Timex/CT	25 February
219	E. Walters/IL	7 February
750	General Time/CT	23 February
763	Bulova Watch/NY	1 February
777	General Time/IL	31 January
781	Bulova Watch/RI	28 January
790	Engr. Research/IN	31 January

MIL-Q-9858A — Military Specification Quality Program Requirement, 16 December 1963

MIL-I-45208A — Military Specification Inspection System Requirement, 16 December 1963

MIL-STD-107E — Military Standard

Preparation and Handling of IPE for Shipment and Storage, 15 June 1974

MIL-STD-480 — Military Standard Configuration Control-Engineering Changes, Deviations and Waivers. 30 October 1968

MIL-STD-461A — Military Standard Configuration Control-Engineering Changes, Deviations and Waivers (Short Form), 18 October 1972

MIL-STD-483 (USAF) — Military Standard Configuration Management Practices for Systems, Equipment, Munitions, and Computer Programs, 31 December 1970

MUCOM Reg. 715-24 — Munitions Command Regulation Preparation of Description of Manufacture, 12 June 1964

OSHA STANDARDS

"The Ordnance Department: Planning Munitions for War," and "The Ordnance Department: Procurement and Supply"; From - "The U.S. Army in World War II", Office of the Chief of Military History, U.S. Army

PBM OSM 70-1 — PBM Operating System Manual "Configuration Management" PM-PBM, 1 April 1976

PEP Inventory (See KE/SAI Report List)

PEPMIS — "Plant Equipment Package Management Information System," Part 4, Chapter 6, JCAP Agreement, November 1975

"Procurement Planning and Policy Guidance" Department of the Army 1 December 1975

RAMP	"Review of Army Mobilization Planning" HQDA/AMC, 18 August 1973
RCS: CSCRD-163	Reports Control Symbol Production Base Plan (PBP)
RCS: CSCRD-166	Reports Control Symbol Layaway and/or Redistribution Project (Exhibit P-17)
RCS: DD-I & L(A)b42	Reports Control Symbol Management of Defense-Owned Industrial Plant Equipment Package (PEP) Status Report (DA Form 3553-R)
RCS: DD-I & L(A) 1201	Reports Control Symbol Industrial Preparedness Planning List (IPPL)
RCS: DD-I & L(A) 1272	Reports Control Symbol Department Industrial Plant Reserve (DIPR); National Industrial Plant Reserve (NIPR) and Reserve Commercially Acquired Plant (RECAP) Reports.
RCS: DD-I & L(SA) 784	Reports Control Symbol Cost of Maintenance of the Industrial Modification Base
SAMPAM	System for Automation of Materiel Plans for Army Materiel (Classified)
SCRAM	Standing Committee for Readiness of Army Materiel Report, "Peacetime Acceleration Planning," 30 October 1975
SP5, SP6	DIPEC Computer Listing IPE Inventory
TM 38-260 (NAVSUPPORT. 523) (AFR 71-18)	Technical Manual Preparation of Industrial Plant Equipment for Storage or Shipment Departments of the Army, the Navy,

(MCO4870-62)	and the Air Force, and the Defense
(DSAM4145.9)	Supply Agency, June 1975

References Researched

ADPA — Industry Lead Time Survey--
Non-Continuous Production of Munitions Items
Industry Advisory Team,
10 May 1974

ADPA — Industry Lead Time Survey--
Stockpiling of In-Process Inventory with Laid-Away Ammunition Production Lines
Industry Advisory Team,
19 March 1976

ADPA — Munitions Production Base Modernization Program, 2nd Phase
Heffelbower, Filbert, Ulrich, Worthen, to BGen Malley,
11 October 1974

AFR 78-13 — Air Force Regulation
Industrial Preparedness Planning
12 December 1975

AFR 78-17 — Air Force Regulation
Plant Equipment Packages,
10 February 1975

American Ordnance Ass'n. — Technical Report
Military-Industrial Relationships in Research and Development Planning
September 1969

Bernhardt, K.R. — Defense Against a Declining Fuze Base
Speech to Fuze Section ADPA,
6 April 1976

Borri, J. and W. J. O'Neill — Final Study Results of the Assessment of the 105mm Tank Ammunition Production Base
AMCPM-PBM,
December 1975

Brochure	Management of the Army Industrial Production Base AMC Industrial Management Division, 2nd Quarter FY 1976
Brochure	Master Layaway Plan MUCOM/APSA, September 1972
Circular 310-1-2	USAMC Circular Acquisition Guidelines 16 June 1975
Comptroller General	Army's Program to Modernize Ammunition Plants Report B-172707 to the Committee on Appropriations, House of Representatives (Undated)
	Configuration Management Plan AMCPM-PBM, March 1975
Demestihas, N. K., and R. D. Clarke	Component Stockpile Study ARMCOM, (Undated)
DPC 76-3	Defense Procurement Circular OASD (I&L), 1 September 1976
Ferrara, T. F., R. D. Goodfriend, J. Morris	An Improved System for Asset Visibility and Control of Army Materiel Command Industrial Plant Equipment Research Analysis Corp. Report RAC-R-140, April 1972
Fiorelli, A. J.	Our Mobilization Base: How Firm a Foundation? "National Defense," January-February 1975

Graham, D. — A Contractor's Observations on Mobilization Planning
Speech to APSA,
Summer 1971

Keating, S. F. — Teamwork for Preparedness
"National Defense,"
July-August 1975

Kunhart, T. J. — ARMCOM SEA Production Line
Start-Up Experience/Problems
Memorandum to J. Kufel, PEP Division,
18 June 1976

Letter — DD1519 and Munitions Contracting
(Assigned Title); sequence:

- o Dayron Corp. to MGen McKeen (RAMP), 18 April 1975
- o DA AMCRP-IP to Dayron Corp., 27 May 1975
- o Dayron Corp. to DA AMCRP-IP, 10 June 1975

Letter — DIPEC Presentation
AMCPM-PBM-G to KE w/Incl.,
6 August 1975

Letter — Industry Participation in Industrial Preparedness Planning
DSA to DA DCS for Research, Development and Acquisition,
31 October 1975

Letter — New Initiatives in Industrial Preparedness Program
DARCOM w/Incl.
7 May 1976

Letter — Plan for Integration of Ammunition Procurement, Mobilization and Production
ARMCOM to DARCOM w/Incl..
24 July 1976

Letter — Review of Army Mobilization Planning (RAMP) Study Implementation
HQDA Ltr 235-75-1,
5 November 1975

Letter — Stockpiling Feasibility Study
PEQUA to DARCOM MSC's w/Incl.,
5 March 1976

Little, A. D., Inc. — Industrial Preparedness in an Arms Control Environment: A Study of the Potential Impact of Sharp Increases in Military Procurement; Vol. III, Appendices
Report ACDA/MEA-246 to U.S. Arms Control and Disarmament Agency,
December 1974

Memorandum — ADPA Advisory Group Leadtime Study Conclusions
To JCAP Procurement and Production Task Group,
23 March 1975

Memorandum — Air Force Planning, Programming and Budgeting
From AMCPM-PBM-PC w/Incl.,
15 November 1975

Memorandum — Integration of Current Procurement with Industrial Preparedness Program (IPP) OASD,
8 June 1976

Memorandum — (To) Members of Committee #6, Industrial Base, ASD (I&L) Nine Functional Areas Steering Group OASD,
13 January 1976

Memorandum — Producers Remaining in the Munitions Production Base
From DRCPM-PBM-GC w/Incl.
February 1977

Memorandum	Use of Negotiation Exception 16 for Procurement from Ammunition GOCO Plants Secretary of the Army to SECDEF, 29 April 1963
Merrill, R. L.	Industrial Preparedness and Mobilization Planning (Assigned title) Letter to Industrial Preparedness Division ADPA, 8 October 1975
Miller, W. H.	Pentagon Frets Over Firms' Sagging Interest in Contracts "Industry Week," 10 May 1976
Minutes	Challenge of Long Term Storage Spring Meeting of the American Ordnance Association Packaging, Handling and Transportability Division, 25-26 April 1972
NAVMATINST 4800.35	Naval Material Command Instruction Data Relating to Cost of Maintenance of the Industrial Mobilization Base 25 July 1967, w/CH-3, 30 July 1971
NAVMATINST 4800.37A	Naval Material Command Instruction Industrial Preparedness Planning Procedures 17 January 1973
NAVMATINST 4802.8	Naval Material Command Instruction Implementation of Industrial Mobilization Planning 27 April 1964
NAVMATINST 4860.17A	Naval Material Command Instruction Retention of Idle Industrial Plant Equipment (IPE) in Contractors' Plants Pending Completion of Industrial Preparedness Planning 15 March 1974

NAVMATINST 4870.22A	Naval Material Command Instruction Defense Industrial Plant Equipment Center (DIPEC) Operations Manual DSAM 4215.1 of April 1968; Navy Supplement to 1 July 1970
NAVMATINST 4870.23A	Naval Material Command Instruction Plant Equipment Retention and Maintenance 27 July 1973
Report	Condition and Operation of DOD Ordnance Production Facilities Logistics Management Institute Task 68-8 to DOD, 3 June 1968
Report	Methods for Determining the Appropriate Government/Industry Mix of Facilities and Equipment Ownership Harbridge House to OASD (I&L), 31 July 1976
Report	Status Report on Critical Skills Study for Munition Production DRCPM-PBM, 15 September 1976
Report	Visit of Ritchie and Lansdowne to PM-PBM, HQAMC, DA, OASD (I&L), DSA. NAVSEA KE/SAI, 30 January 1976
Report	Visit of Ritchie, Lansdowne, and Silliman to ADPA Conf., ARMCOM, JCAP, and PEQUA KE/SAI, 12 February 1976
Report	Visit of Ritchie and Lansdowne to ARMCOM KE/SAI, 18 October 1976

Richards, J. C. — JCAP Decision Models
Presentation to ADPA,
3 February 1976

SECNAVINST 4870.17 — Department of the Navy Instruction
Plant Equipment Retention and
Maintenance
9 January 1973

SECNAVINST 7000.14B — Department of the Navy Instruction
Economic Analysis and Program
Evaluation for Resource Management
18 June 1975

Slemrod, S. — The Know-How Bank
"National Defense,"
January-February 1975

Straus, S. — (Untitled: see Merrill)
Letter,
10 October 1975

Ulrich, J. A. (Chmn.) — Industry Lead Time Survey:
Stockpiling of In-Process Inventory
with Laid-Away Ammunition Production
Lines
ADPA Industry Advisory Team,
19 March 1976

White, H. N., and
L. M. Smith — Managing an Ammunition Production
Base for Mobilization Support
Report No. PMSA-2-3,
January 1975

D. SUMMARY: EQUIPMENT REHABILITATION PLAN (KE/SAI REPORT No. 75-86-R-2, March 1976)

The retention of plant equipment packages (PEP's) has been authorized by the Assistant Secretary of Defense (Installation and Logistics) to encourage private industry to participate in the mobilization production program. The PEP's supplement the capability maintained by private industry. Equipment contained in the PEP's was found to be approaching or exceeding its useful life, and therefore, Contract DAAA21-75-C-0303 was awarded to Kaiser Engineers in association with Stetter Associates to develop a plan for modernization of the munitions mobilization base.

One task in the program was a study of the policies and procedures applicable to the rehabilitation of the equipment associated with the PEP producers. Policies and procedures applicable to PEP are currently contained in numerous documents, but they are reasonably complete for the needs of PEP. It is recommended that all policy and procedures applicable to rehabilitation of PEP be assembled into one manual.

The modernization of IPE will be studied with respect to specific assignments within each production line. The fundamental difference for rehabilitation between PEP and the general equipment reserve is that PEP IPE can be rehabilitated to a specific capability, while the general reserve is rehabilitated to a general capability. This difference provides flexibility in PEP for the selection of various levels of rebuild to achieve a more economical rehabilitation of lines. Definitions were developed to clarify the various levels of rebuild and to include both OSHA and pollution abatement requirements. Criteria were developed for the selection of equipment that should be retained for rehabilitation and equipment that should be replaced.

Between 15,000 and 20,000 pieces of IPE may require rehabilitation during the modernization program. Four primary sources for rehabilitation were identified: the producer, OEM equipment producers, commercial rebuild companies, and Government-owned and operated depots. Considerations for the selection of the rebuilding source are presented. The number of the machines involved and the need to maintain a readiness posture with minimum additional stockpiling requires that all four sources for rehabilitation be used.

The retention of maximum readiness suggests that the rebuilding program should be on a line-by-line basis. Economic considerations dictate that IPE be grouped and rebuilt by class and manufacturer. This study presents methods for accomplishing both objectives. A separate analysis is recommended to provide maximum readiness through the use of a rebuilding pool of IPE from the general equipment reserve. Machines could be rebuilt and substituted on a one-for-one basis with no loss in readiness. Because of the extensive nature of the economic, technical, and readiness considerations required for that study, it has not been performed as part of this study.

A matrix approach to rehabilitation planning was presented whereby the equipment needs by line are compared with equipment availability. Such a preswntation allows the covering of priority 1 and 2 voids with priority 3 and 4 IPE. It would also tolerate changes in priority and end items with a minimum disruption of the rehabilitation plan.

In addition to the recommendations mentioned above, some of the major recommendations made as a result of the studies in this task are:

- Prioritize all lines, and schedule rehabilitation by lines with grouping of machines within and between lines with concurrent schedules.
- Utilize the general equipment reserve to cover as many voids as possible during rehabilitation. Study as a separate task the use of the general reserve to eliminate all voids during the rehabilitation program.
- Rehabilitate IPE to the level of performance necessary to accomplish the operation to which it is assigned. Do not rehabilitate all equipment to an arbitrary level.
- The reutilization value percentage should be modified for PEP to better reflect the laid away nature of the line or the extension of the useful life of IPE as a result of storage, as well as the upgrading for OSHA and pollution abatement requirements.
- Maintain a current analysis of producer-owned IPE capability and producibility.

- Increase continuing control of all Government-owned IPE associated with a PEP line as well as the critical OPE.

- Consider a matrix approach to rehabilitation that presents all needs versus all capabilities.

E. SUMMARY: EQUIPMENT LAYAWAY PLAN (KE/SAI REPORT No. 75-86-R-3, March 1976)

Plant equipment packages are authorized and established in accordance with DOD policy to encourage producers in private industry to be prepared and to participate in the mobilization preparedness program when it is not feasible for private firms to do so on their own. Layaway of IPE from PEP's, when not required for immediate use, has been performed in the past with questionable success as to the ability of the IPE to perform the desired task for which it was retained.

KE/SAI studied the current policies and procedures relating to PEP layaway to develop an understanding of current practices. Visits to central storage depots as well as visits to laid away munitions plants provided first-hand appraisal of preservation techniques and materials. Information was obtained from visits to DIPEC, ARMCOM, and PEQUA.

This layaway report identifies the requirement for additional considerations that may be needed to develop full confidence in each PEP line so that reliable, fast reactivation under mobilization conditions can be achieved. Key recommendations contained in this report include the following:

- Compile into one reference manual all information relative to PEP policies, procedures and management.
- Implement and enforce current and revised PEP policies and procedures to enhance responsive capability.
- Provide bonded storage when storing PEP equipment in producers plants.
- Provide humidity-controlled storage for long term PEP layaway.
- Do not use PEP's that are not assigned to producers (X-facilities) in the production base assignment (PBA) unless complete production lines are laid away.
- Consider flexible environmental containers for preservation of IPE where other facilities are not available.

- Retain certain items other than Government-owned IPE in layaway to provide faster mobilization response. These items include process sheets and production line layout, special tooling, test and inspection equipment, OPE of a special nature, special producer-owned IPE, inspected parts from each production operation, tool and inspection gage drawings, and special toolroom facilities for production maintenance.

- Revise the PEP recertification process to include certification of PEP capabilities.

- Conduct research and development of new preservation materials and their uses.

- Document actions to be taken to reactivate IPE from idle PEP's during mobilization and establish an efficient method to record IPE reactivation when formalized methods are not used.

- Use available computer programs for economic analysis to develop the lowest cost of component, end item, and production equipment storage.

- Investigate the development of a Government tool center to provide services for producing, transposing programs and format, and storing numerical control (N/C) tapes to reproduce all Government munitions tooling as well as establishing tooling standards.

- Inaugurate inspection of IPE assigned to PEP's for operating condition while in layaway to provide assurance of production capability.

KAISER ENGINEERS

DIVISION OF HENRY J. KAISER COMPANY
KAISER CENTER · 300 LAKESIDE DRIVE
OAKLAND, CALIFORNIA 94666

November 16, 1976

F. LETTER TO FORMER PRODUCERS

(Addressee)

Subject: Analysis of Munitions Plant Equipment Packages (PEP's) Formerly Assigned to Producers

Gentlemen:

Kaiser Engineers and Stetter Associates, Inc. are currently engaged in a contract with the Project Manager, Munitions Production Base Modernization and Expansion, Picatinny Arsenal, to analyze the PEP's that produce munitions metal parts in the private sector. The purpose of the study is to develop recommendations for modernizing and upgrading each PEP. Included in this analysis are the PEP's formerly assigned to a planned producer but currently unassigned.

As part of this modernization study, we are also reviewing policies and practices in munitions mobilization planning as it interfaces with the PEP's in the private sector, and are developing recommendations for changes in these policies and practices that will encourage PEP producers to remain in the base or former producers to return to the base. In connection with this, we have been requested to ascertain, if possible, the reasons for each former producer's withdrawal from participation in the mobilization production base. This information will provide a basis for improving the management of the production base and the relationship of the Army with the planned producer.

Your firm is one of those former planned producers that has discontinued participation in mobilization planning for munitions metal parts production. Our records indicate that ______(Addressee)______ was formerly a planned producer under PEP No. _________.

We should appreciate your advising us, in our current capacity as the Project Manager's representative in this matter, of the reason(s) for the withdrawal of your firm from the PEP production base. Your reply will not be published in the report of our study but will be used, along with replies from other former producers, as a basis for recommending improvements to the Army's industrial preparedness planning policies, procedures, and practices.

Your cooperation in this matter will be greatly appreciated.

Very truly yours,

KAISER ENGINEERS
Division of Henry J. Kaiser Company

Philip D. Bush
Vice President

PDB:pls

ND

CO

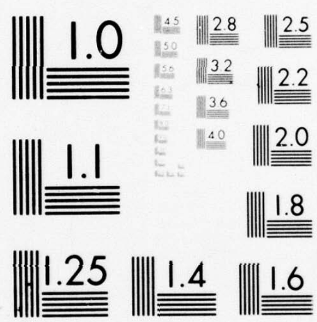
AD-A039 561 KAISER ENGINEERS OAKLAND CALIF F/G 15/5
PLANT EQUIPMENT PACKAGE (PEP) MODERNIZATION PROGRAM. VOLUME 9. --ETC(U)
MAY 77 DAAA21-75-C-0303

UNCLASSIFIED 75-86-R-9 NL

5 OF 5
AD
A039 561

SUPPLEMENTARY
INFORMATION

END
DATE
FILMED
10-77
DDC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963

SUPPLEMENTARY

INFORMATION

AD-A039 561

KAISER ENGINEERS

DIVISION OF HENRY J KAISER COMPANY
KAISER CENTER · 300 LAKESIDE DRIVE
OAKLAND, CALIFORNIA 94666

2 June 1977

Serial No. A-306

Department of the Army
PM/PBM, Building 171
Dover, New Jersey 07801

Attention: Mr. James F. Cannon (DRCPM-PBM-G)

Subject: Contract No. DAAA21-75-C-0303
Plant Equipment Package (PEP)
Modernization Program
Kaiser Engineers' Job No. 75086
Final Report - Volume 9 - Analysis of the Current PEP Concept for Munitions Metal Parts Production in the Private Sector

Gentlemen:

The subject report was inadvertently published with the attached page III-53 omitted. Please insert it in the report mailed to you by our letter Serial No. A-294 dated 12 May 1977.

Cordially yours,

H. W. Flippen
Project Manager

HWF/sah

DISTRIBUTION:

DRCPM-PBM-G
DRDAR-PRW-A
DRSAR-IM
DRXPE-IP
DRDAR-TS-TSS
SARFA-MT
DA-PPM-D
DDC
DRCPM-PBM-LN1
SEA 9926M

(1) Production Base Plan requirements

(2) Industrial base commitments; DD Form 1519, facilities contract, or other instruments

(3) Industrial plant equipment inventory/condition assessment (Paragraph 4.a.b.)

(4) Manufacturing engineering analysis (Paragraph 3.c.)

(5) Identification of planned item(s), associated manufacturing process(es), and any assigned PEP's

The technical approach for the Resources/Requirements Analysis can be found in Subsection VI.E, with the acquisition process in accordance with Paragraph III.G.6.a. The expected results include the following:

- Expansion of the basic Resource Management System scope to incorporate into the Management Data Bank all industrial plant equipment of whatever type and wherever located in the munitions production base and to permit ready retrieval of data pertinent to industrial plant equipment readiness and capability.

- A complete accounting of the total munitions production base, thus permitting industrial plant equipment allocations to be made in a timely and realistic context.